

# ELECTRICAL REVIEW

FRIDAY  
17 MARCH 1961

WEEKLY  
PRICE 1s 6d



Aberdare Cables

Aberdare Cables Ltd manufacture  
a comprehensive range of paper insulated and  
thermoplastic cables; to British Standard or  
foreign specifications as required.

**MEM** introduce a new

## range of 500 volt SWITCHGEAR

CHROME PLATED FRONT OPERATING  
SWITCH HANDLES

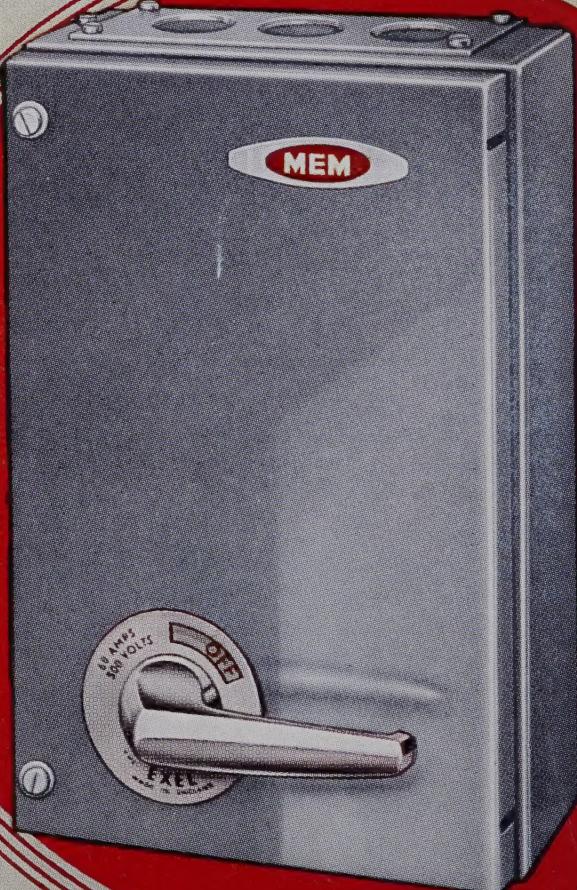
FABRICATED STEEL ENCLOSURES

SEMI-ENCLOSED REWIRABLE  
OR H.R.C. CARTRIDGE FUSES

15, 30, 60, 100 AMPS

**'EXEL'**  
**SWITCHES AND SWITCHFUSES**

- Fabricated cases are of heavy gauge sheet steel with hinged covers, rustproofed and finished grey stove enamel.
- The "Exel" range is fitted with chrome plated front operating switch handles, a feature which permits more compact assemblies on switchboards or panels.
- The "ON" and "OFF" positions are clearly shown by an indicator associated with the switch handle.
- Fuse bases are of the new "Kantark-Exel" pattern, which will accept semi-enclosed rewirable or H.R.C. cartridge fuse carriers.
- M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links to B.S.88:1952, Appendix 'J' Dimensions, Form A—Offset Tags.
- M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear, and have been A.S.T.A. certified for Category of Duty 440 AC3 (16,500 amps), 440 AC4 (33,000 amps) and 440 AC5 (46,000 amps).



- "Exel" switches comply with the relevant Temperature Rise, and Making and Breaking Capacity Tests of B.S.861: Part 1, 1955, and switchfuses with B.S.2510:1954.

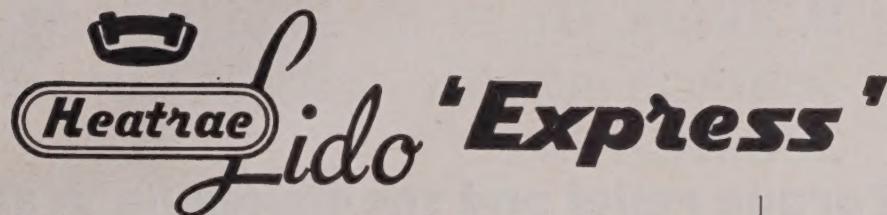
. . . and so many other features, too

Write for M.E.M. List No. 450

**MEM**

SEE THE LATEST DEVELOPMENTS IN M.E.M.  
SWITCHGEAR DESIGN ON STAND NO. D. 6  
A.S.E.E. MARCH 21-25

# AN OUTSTANDING ACHIEVEMENT IN WATER HEATING



## *the most up-to-date* **AUTOMATIC ELECTRIC SINK WATER HEATER**

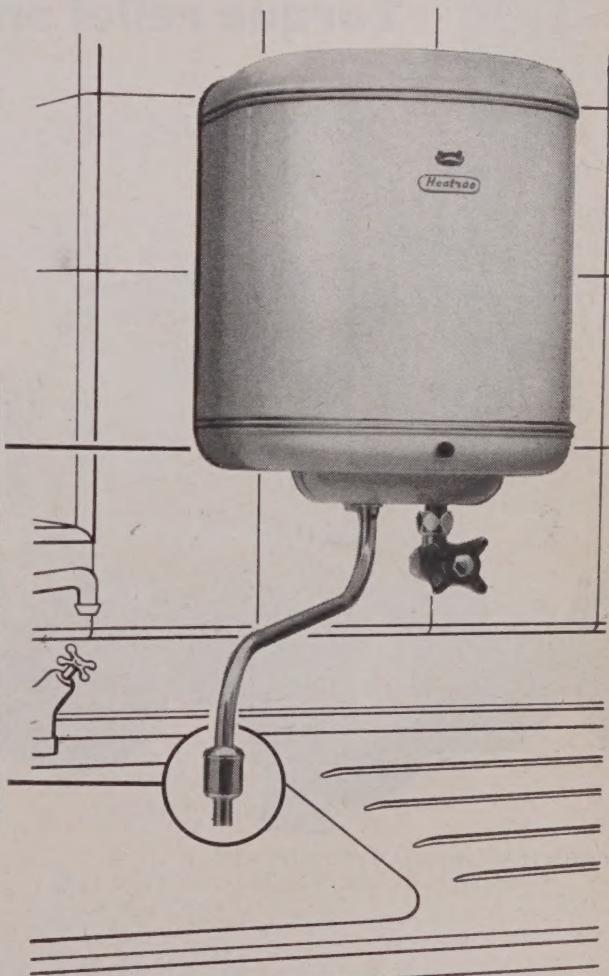
Never before has such value, performance, style and craftsmanship been embodied in an automatic sink water heater. The classic styling of the Lido Express will grace any kitchen—and it will maintain its spotless appearance indefinitely.

A special high-efficiency heating element is incorporated, which provides a continuous supply of piping hot water up to a maximum of **9 GALLONS PER HOUR.\*** Diluted with cold, this means approximately 18 gallons at washing-up temperature—adequate for most average households.

### **2 UNIQUE FEATURES**

● THE ECONOMY EYE gives visual indication of when the current is 'on'—and proof of the low running cost.

● SPECIAL DISPENSER END to outlet spout gives complete flow control and instant cut-off on closing the valve.



Colours: White or Cream

Loading: 3kW or 2kW

Voltage: 200/220 or 230/250 A.C. only

\* 6 gallons with 2kW Loading

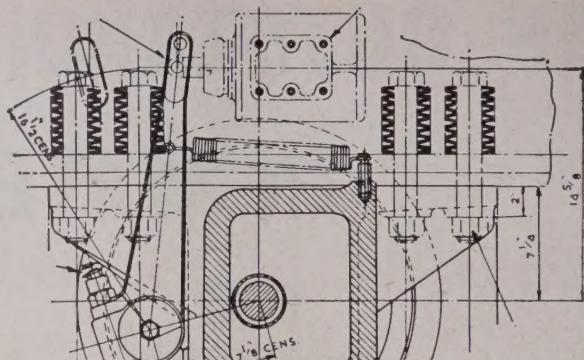
Write today for  
**LEAFLET No. 92**

**HEATRAE LTD**

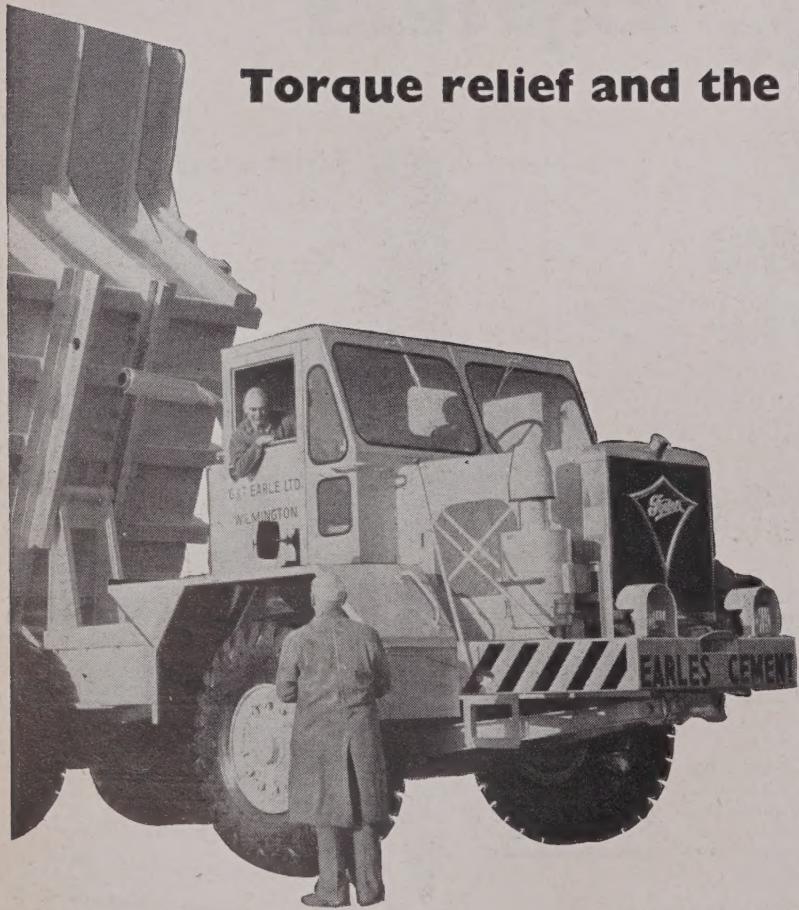
NORWICH · NORFOLK · NOR 29A · ENGLAND

Telephone: NORWICH 23193

Telegrams: Heatrae, Norwich



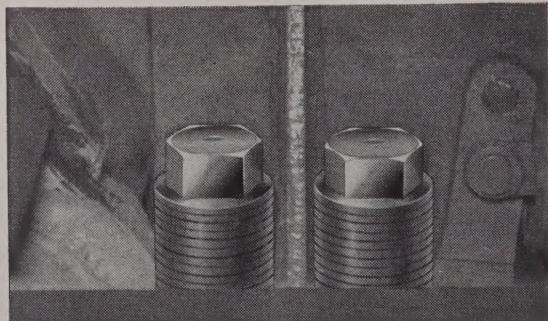
## Torque relief and the Belleville Washer



Illustrations by kind permission of Messrs. Fodens Ltd.

Messrs. Fodens Ltd., fit Belleville washers in packs of 7 pairs on their F.R.6/45 Heavy Duty Dumper. This proved to be the most effective method of relieving twisting of the rear axle case produced by braking and transmission torques. The potential uses of Belleville washers are endless.

They provide the perfect answer to engineering problems where resistance to load or thrust is beyond the capacity of helical springs. Their fractional movement under heavy load has solved design difficulties in almost every industry. Salter technicians can help you. Their services are freely at your disposal.



# SALTER

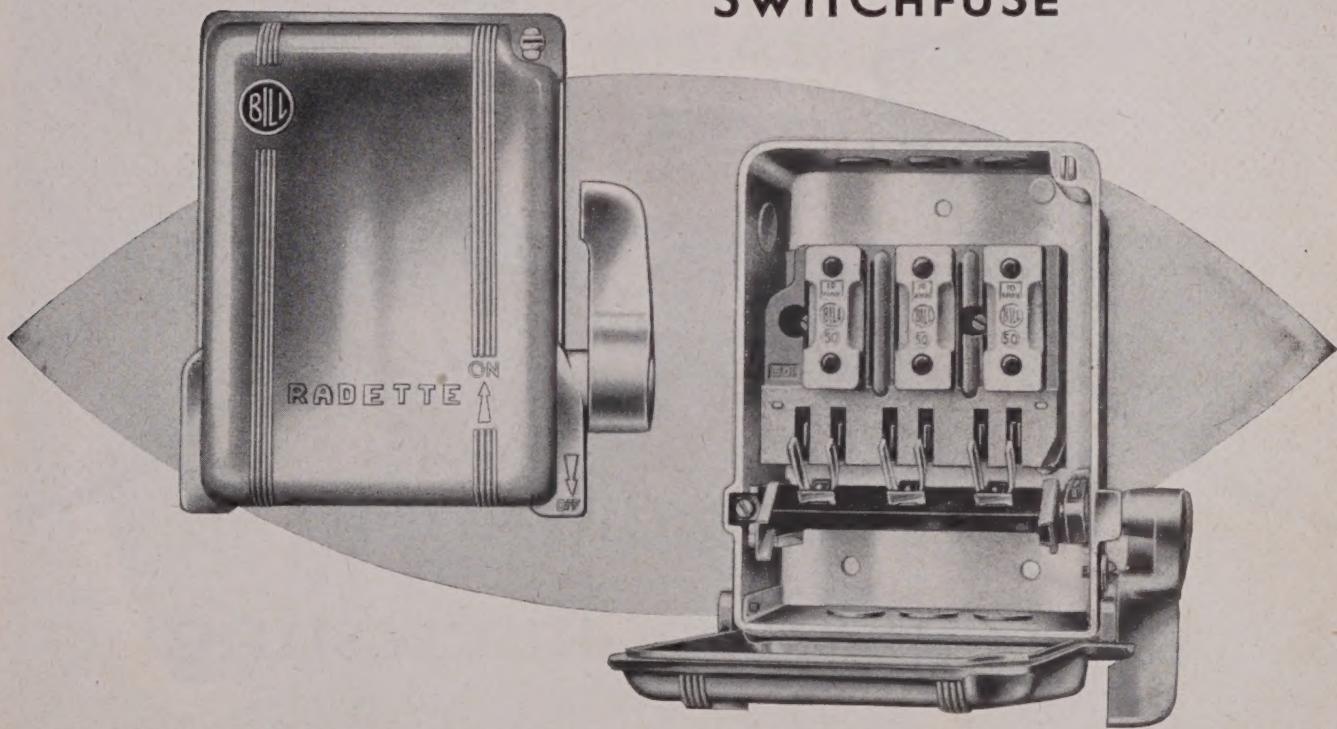
MAKE THE FINEST BELLEVILLE WASHERS



*You cannot buy better gear*



## RADETTE Q1438 MARK II THE MODERN MOTOR CONTROL SWITCHFUSE



- DESIGNED FOR CONTROLLING SMALL MOTORS NOT EXCEEDING 5 H.P.
- 10 AMPERE 500 VOLTS, 3 PHASE, QUICK MAKE AND BREAK SWITCH WITH SUBSTANTIAL CONTACTS FOR HIGH CONTACT EFFICIENCY AND LONG LIFE
- Bill ARC DAMPING TYPE FUSES FITTED COMPLETE WITH FUSE WIRE BY QUICK ACTION CLAMPS
- AMPLE KNOCKOUTS AND GENEROUS WIRING SPACE PROVIDED. 3— $\frac{3}{4}$ " KNOCKOUT HOLES TOP AND BOTTOM. 1— $\frac{3}{8}$ " KNOCKOUT HOLE IN LEFT HAND SIDE FOR STARTER CONNECTION.
- 'THROUGH' WIRING ARRANGED UNDER THE SWITCH BASE
- NO DISMANTLING OF SWITCH MECHANISM IS NECESSARY
- SOLID FORTOL BRUSH BAR TO ELIMINATE EARTHING
- FINISHED IN Bill SILVERLOSE— A DURABLE STOVED ALUMINIUM ENAMEL

ELECTRICAL ENGINEERS  
(A.S.E.E.) EXHIBITION

BILL SWITCHGEAR LTD  
BIRMINGHAM 20

Invite you to  
STAND No. L8

LONDON, S.W.1  
A. W. ZELLEY,  
N. PAYNE,  
R. W. HANKINSON  
GILLINGHAM ST.

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G. H. GARRETT,  
H. WILLIAMS  
HEAD OFFICE

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C. G. BACHELOR  
HEAD OFFICE

EAST MIDLANDS  
J. A. PEARCE  
HEAD OFFICE

BRISTOL, 3  
W. L. WHITE,  
CHURCH LANE

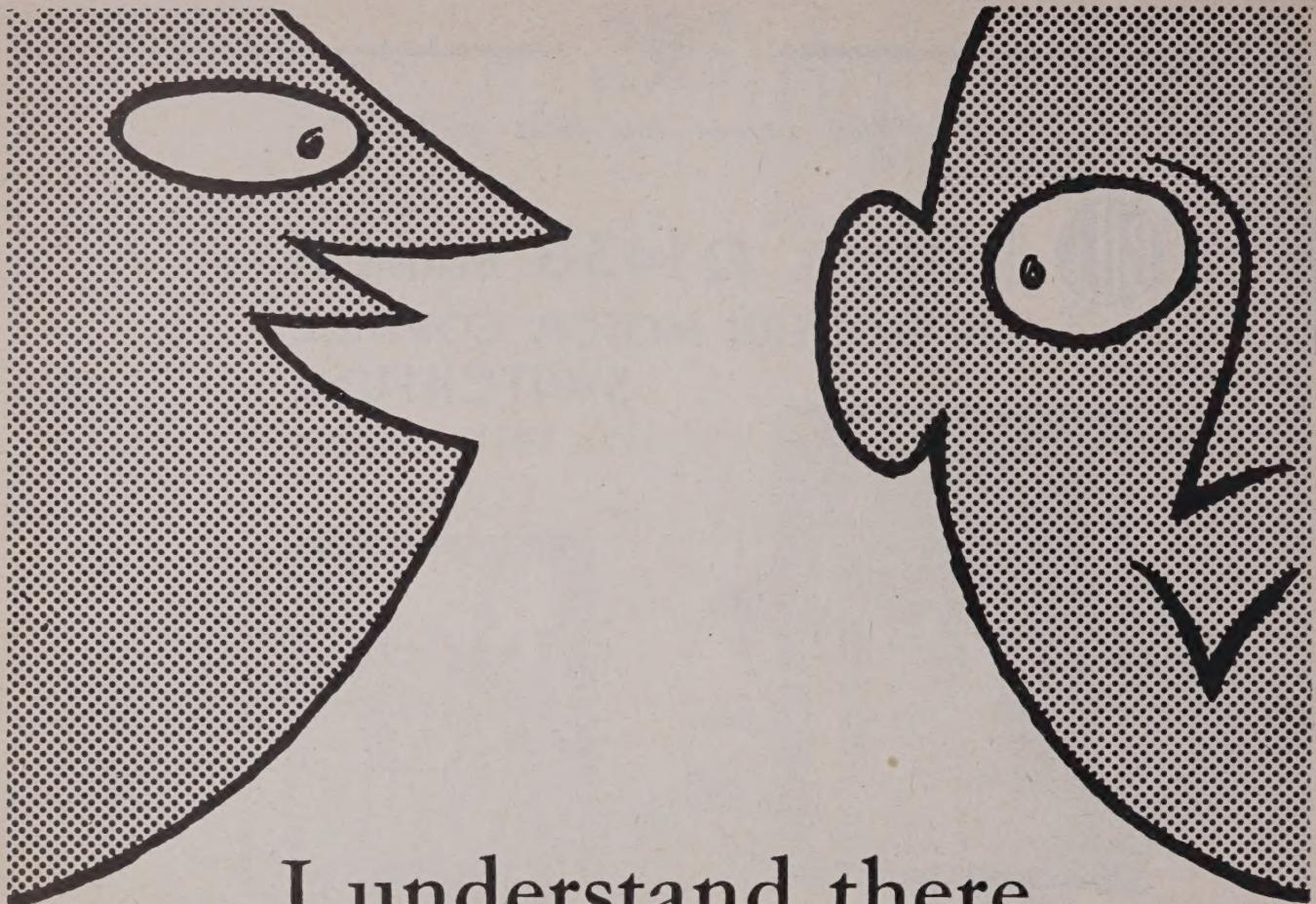
LEEDS, 14.  
N. SHARPLES,  
G. SUTTON,  
WOODLANDS FACTORY.

CHELTENHAM  
C. GEARING,  
HIGH ST.

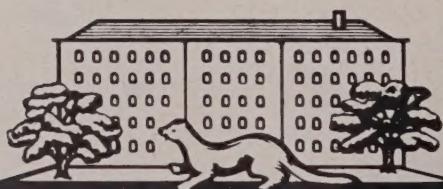
MANCHESTER, 3  
J. BALLENTINE  
J. H. RAMSAY,  
F. A. MAYOR,  
WOOD STREET

GLASGOW  
J. D. HARRIS,  
SANDYFORD PLACE

BELFAST  
R. A. SIMPSON,  
DONEGALL ST.



I understand there  
are some very interesting  
exhibits on the



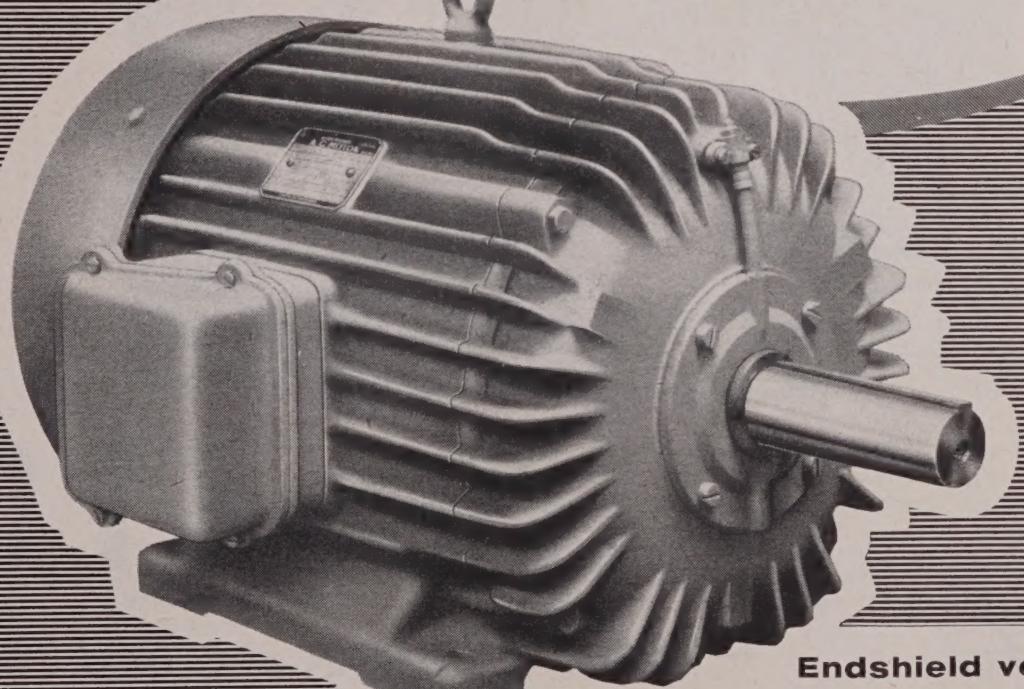
**OTTERMILL**

STAND N° G14

You ought not to miss them

# AEI British Standard Dimension Motors (BS2960 Pt 2)

**MEASURE UP  
PERFECTLY**



**Endshield versions**

**available for all ratings**

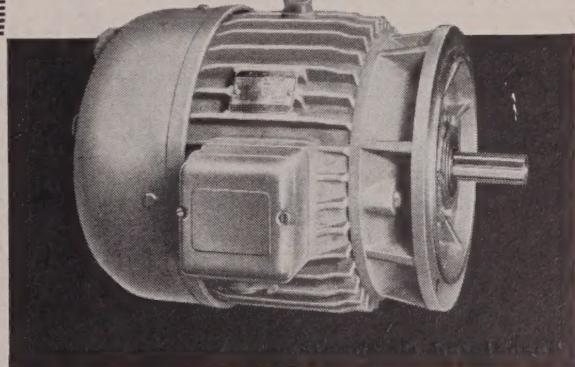
Interchangeable with drip-proof  
machines to B.S. 2960 (Pt 1)

Class 'E' insulation

High power/weight ratio

Compact construction

NOW AVAILABLE UP TO 50 H.P.



*Please write for further details*

**Associated Electrical Industries Limited**  
**Motor and Control Gear Division**  
**SMALL INDUSTRIAL MACHINES SALES**  
**Blackheath, Staffordshire, England**

A5629

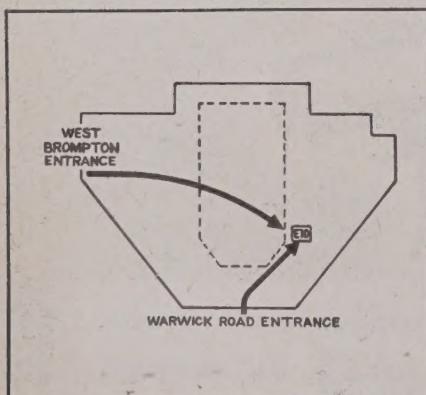
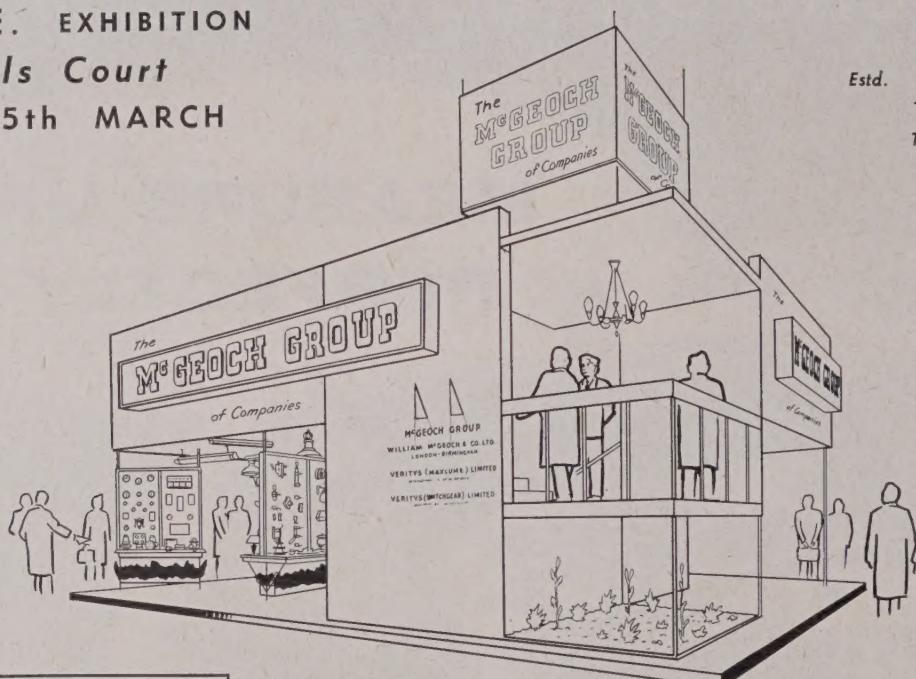
Visit Stand No. K.14 at the A.S.E.E. Exhibition, Earls Court, March 21-25

**AEI**

# MCGEOCH

A.S.E.E. EXHIBITION  
Earls Court  
21st-25th MARCH

Registered  
Estd. 1832  
MC  
Trade Mark



**visit us on STAND E10**  
— same position as last year

Exhibits include:

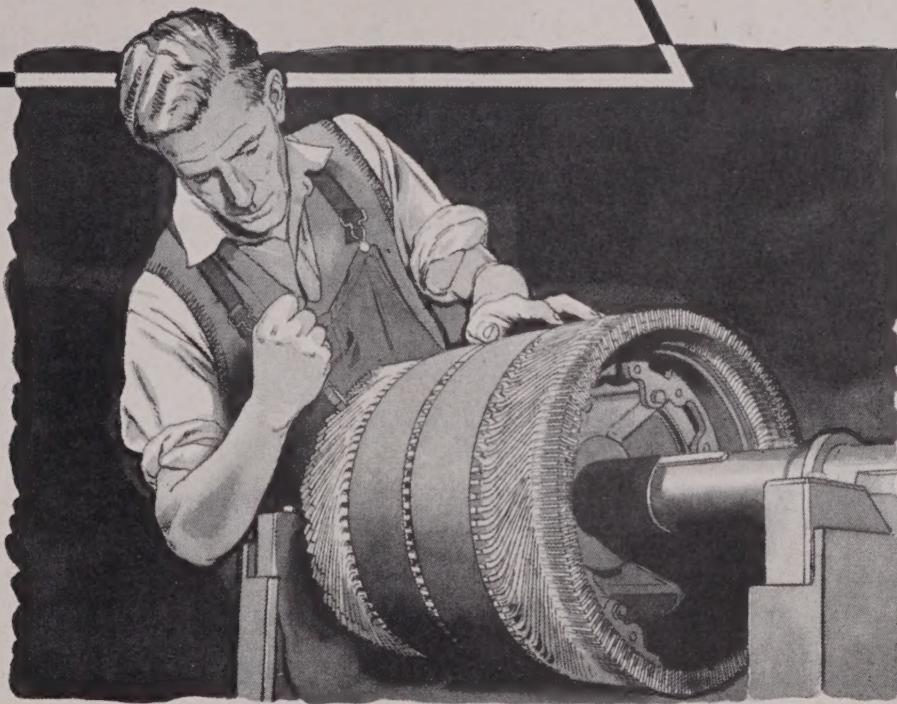
- SWITCH and FUSE GEAR and CONTROL CUBICLES
- WATERTIGHT SOCKETS and PLUGS including MULTI-PIN
- INDICATOR LIGHTS and MULTI-LIGHT UNITS to requirements
- LIGHTING FITTINGS, LAMPHOLDERS, MOULDINGS, etc.

Associated Companies:

VERITYS (MAXLUME) LTD. for LIGHTING EQUIPMENT of all types  
VERITYS (SWITCHGEAR) LTD. for ELECTRICAL CONTROL GEAR  
ASTON, BIRMINGHAM 6

WILLIAM MCGEOCH & CO. LTD., BORDESLEY, BIRMINGHAM 10 also GLASGOW and LONDON

# Manual Skill or Power Tools

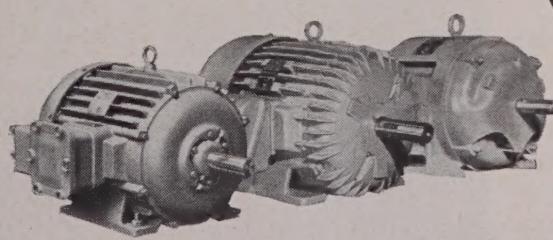


A.S.E.E.  
ELECTRICAL  
ENGINEERS  
EXHIBITION  
EARLS COURT  
MARCH 21st-25th  
VISIT US ON  
STAND M.12

In this age of automatic machines, there are still some tasks which require the touch of an experienced hand. Bending the bars of this slip ring rotor for instance, to give it the required electrical characteristics.

Electric motor making combines a variety of manual skills with modern automated production equipment for component manufacture. A Brook electric motor contains the best of both spheres; mechanical precision and experienced labour.

They give you the world's most respected motor.



The Brook Industrial range includes Drip Proof, Fan Cooled and Explosion Proof types. Horse Power ratings up to 600 according to type and speed.

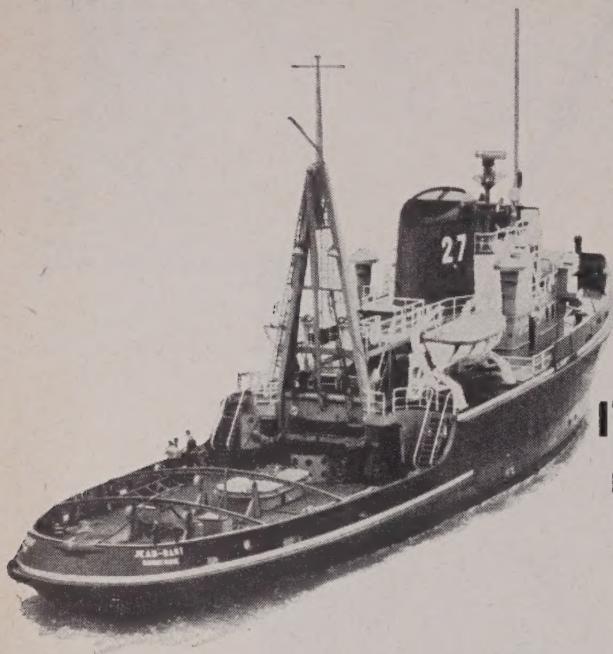


Use Brook Control Gear, automatic or hand operated types to match popular motor ranges.



**BROOK MOTORS LIMITED**  
HUDDERSFIELD · ENGLAND

# FOR ABSOLUTE RELIABILITY IN TRANSMISSION



*the mighty JEAN BART*

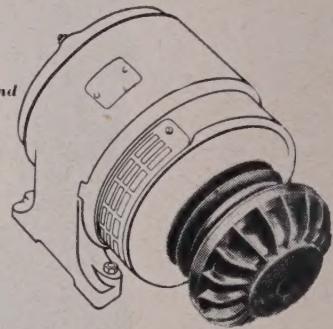
**DEEP SEA TUG**

**USES**  
**DRY FLUID POWDER COUPLINGS**

A C9 type of coupling is used between each of the two TNAB 338 Werkspoor 8-Cylinder Diesel engines, and the single reduction and reverse gearbox.

WITH INDUSTRIAL TYPE ELECTRICAL MOTORS:

- IT REDUCES** the peak amperage during starting
- ELIMINATES** starting shock and snatch
- PREVENTS** overloading electric motors and burning them out; breakage of fragile materials due to sudden starting shock; damage due to overload.
- INCREASES** the life of belt and gearing.
- PERMITS** inching and rapid reversal.
- SAVES** the cost of high starting torque motors.
- RELIEVES** the motor of load.



for technical information and assistance write to:

**POWDER COUPLINGS LTD.**

A Member of the Specialloid Group of Companies  
AIREDALE WORKS, HUNSLET ROAD, LEEDS, 10  
Telephone : Leeds 20936 & 31471/7



## EYELETTING and light PUNCHING MACHINES

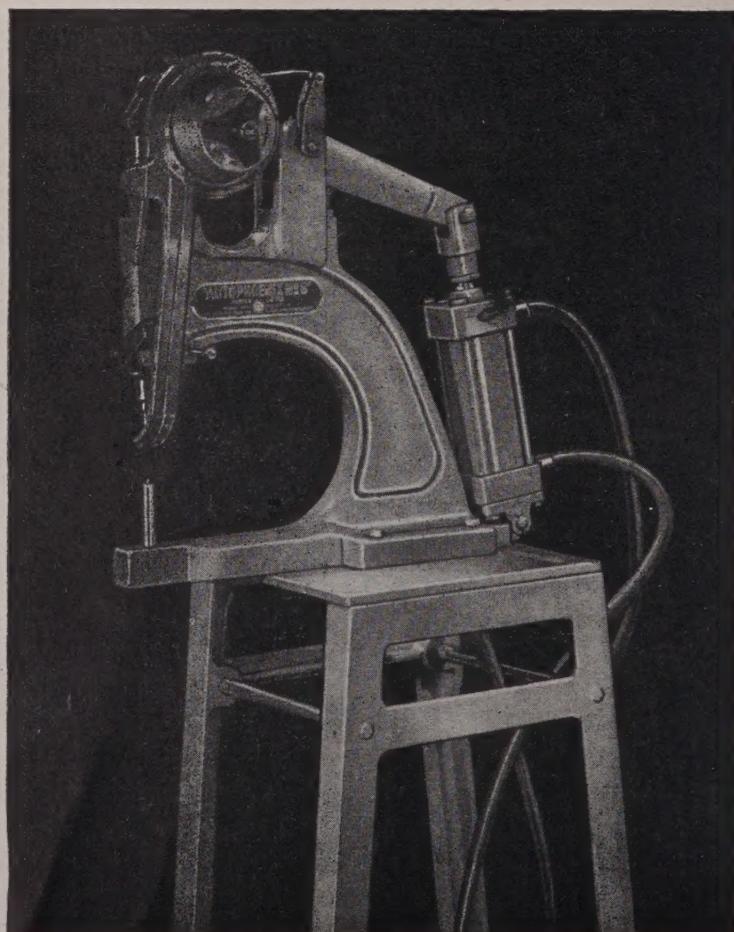
AUTOPHOENIX No. 6A. A New and improved air-operated machine for the automatic insertion and closing of eyelets. The deep throat, high vertical gap and projecting base make this an ideal machine for the eyeletting of components in radio chassis even in the closest corners and, of course, for spinnings, cylinders and plastic mouldings. It can be supplied with built-in air compressor.

We manufacture a large range of hand and automatic Eyeletting and Piercing Machines and also stock eyelets which we can supply in small or large quantities. For illustrated brochure of the "Phoenix" machines, write for leaflet E.R.I.

We are showing at the A.S.E.E. Exhibition Stand P.9, 21st-25th March

**H U N T O N L T D .**  
PHOENIX WORKS, 114-116 EUSTON RD.  
LONDON, N.W.1

Tel.: EUSton 1477 (3 lines) Grams: Untonexh, London



# *today's stock orders...*



## *...get moving today*

*stock  
cables  
from  
Erith  
come  
faster!*

Your orders don't lie on our desks—they get immediate attention.  
We have a wide range of standard cables in stock  
—ready for cutting and delivery to you within forty-eight hours!



**POWER CABLES DIVISION**

ERITH WORKS · BELVEDERE · KENT



CONTROL GEAR

DIVISION

are  
there

A large, solid black arrow points downwards from the GWB logo towards the exhibition details.

**ON STAND B5 A.S.E.E. EXHIBITION  
EARLS COURT MARCH 21-25**

If you are unable to visit our stand at the Exhibition, contact us and we will be pleased to send details of appropriate products, or will have a representative call to discuss your requirements.

**CONTACTORS**

**ISOLATORS**

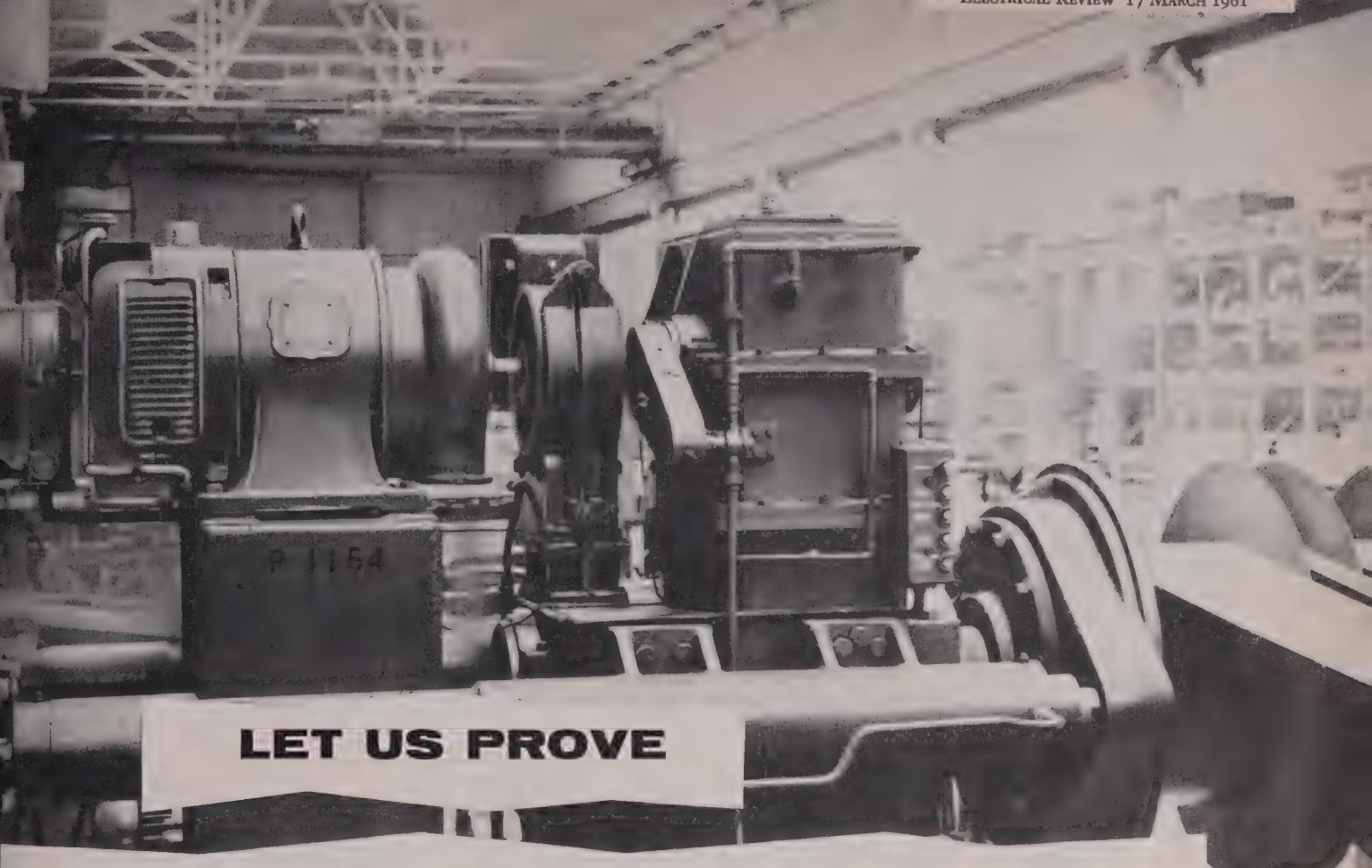
**CIRCUIT BREAKERS**

**CONTROL PANELS**



**GWB FURNACES LTD (CONTROL DIVISION) DIBDALE WORKS DUDLEY WORCESTERSHIRE**

ASSOCIATED WITH GIBBONS BROS LTD AND WILD BARFIELD ELECTRIC FURNACES LTD.



**LET US PROVE**

## **THAT FULLER COMMUTATOR MOTORS**

**CUT POWER COSTS**

All industrial processes differ but optimum output  
is a consideration common to all.

The *INFINITE* variable speed characteristic of the Fuller  
A.C. Commutator Motor means that your machine can be  
operated at *precisely the exact speed* to give maximum  
output of quality and quantity. The speed required is  
maintained irrespective of normal load variation.  
Commutator Motors require no resistance or external  
regulator; current consumption is reduced at lower  
speeds bringing savings in power costs.

We shall be glad to explain how your factory  
can benefit by using Fuller Commutator Motors.

Here a Fuller Commutator Motor is applied to  
the gang slitting of cold rolled core plate for  
transformer manufacture. The speed of the  
15 h.p. 1450 r.p.m. motor is automatically  
controlled by the increasing diameter of the  
rotating take-off coil.

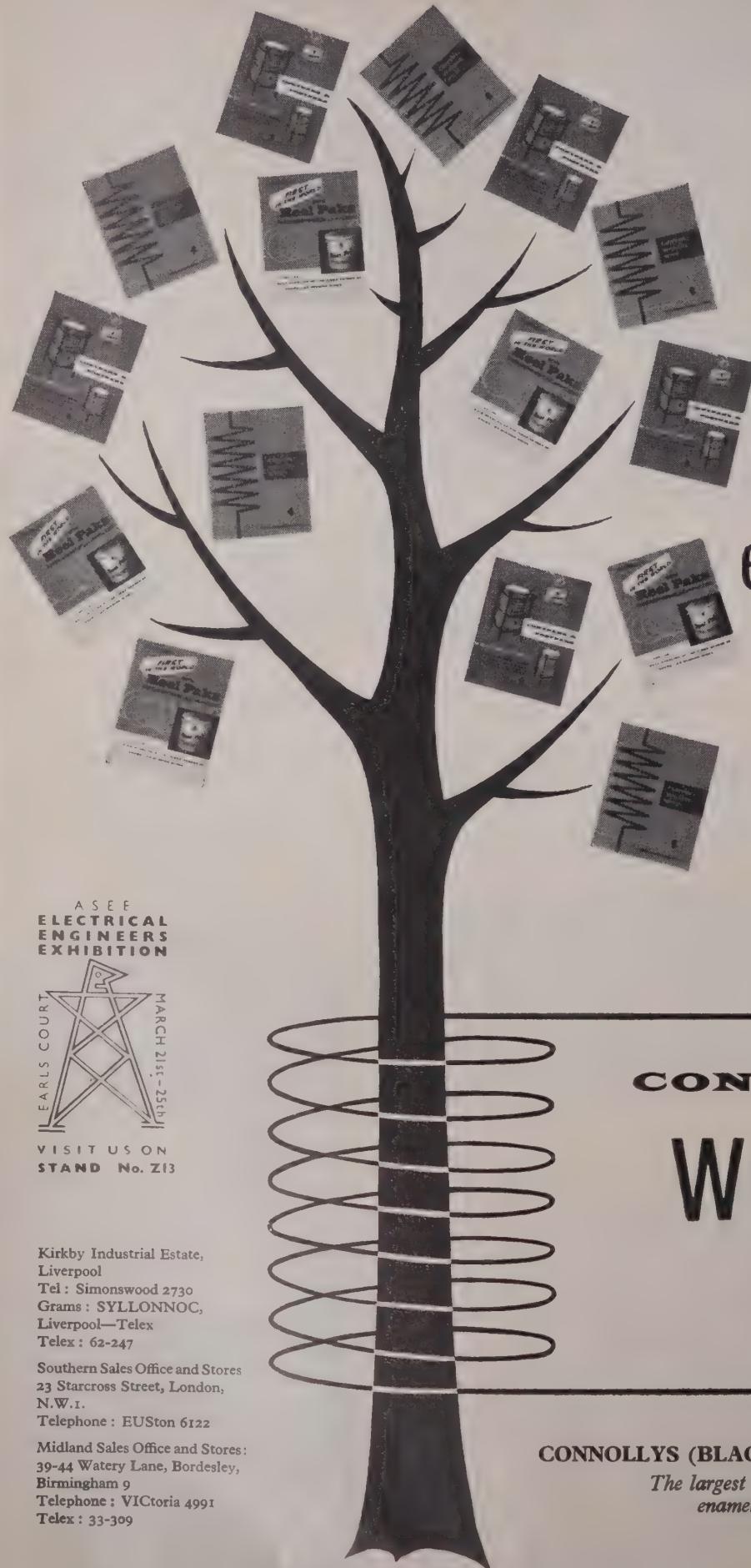
*consult-*



A member of the Hawker Siddeley Group

Sole U.K. representatives for ASEA Sweden  
**FULLER ELECTRIC LIMITED**  
FULBOURNE ROAD · LONDON E.17  
Telephone: LARKwood 2350

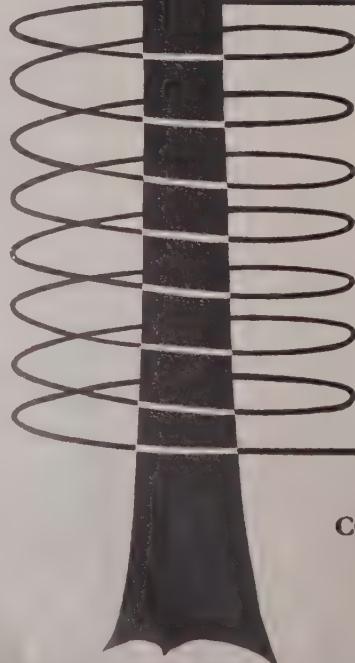
Also at Birmingham, Glasgow and Manchester



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Connollys' fine enamelled winding wires make a big contribution to increased reliability and speedier production. The latest Connollys publications, covering the complete range of winding wires, provide a valuable source of information for the designer and coil winder.

Free copies will be gladly sent on request.



A S E E  
ELECTRICAL  
ENGINEERS  
EXHIBITION  
EARLS COURT  
MARCH 21st - 25th  
VISIT US ON  
STAND No. Z13

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**CONNOLLYS**

# WINDING WIRES

**CONNOLLYS (BLACKLEY) LIMITED**

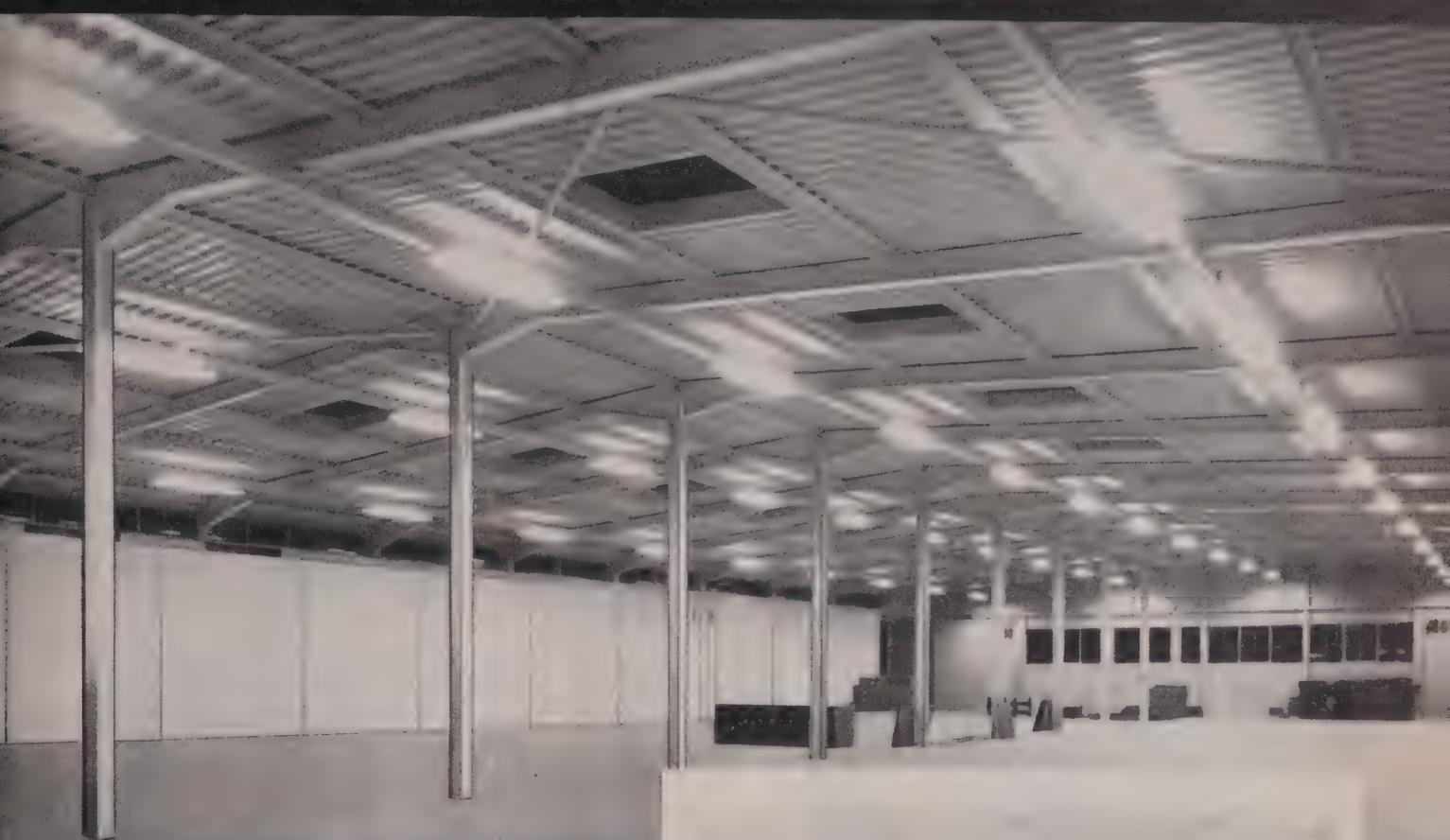
*The largest manufacturers of fine  
enamelled wire in the world*



# TASKMASTER

REGD.

# LIGHTING TRUNKING



*-the answer  
in the  
long run*

*Benjamin Lighting Trunking reduces installation cost and maintenance to a minimum. The system gives real flexibility with simplicity of design. The stringent specifications include these features:*



- Light in weight but immensely strong. 9 ft. or 15 ft. centres for suspension with maximum loading.
- One-piece rolled section.
- Easy installation. Joints and suspensions carry the load whilst securing bolts are tightened.
- Lighting units can be moved easily to any position.
- Simple fixing of all fittings and lamps. Easy access to cables, switches, plugs.
- Designed for 8 ft., 5 ft. and 4 ft. standard 'Taskmaster' reflectors and tungsten range.

better lighting by

**BENJAMIN**

ONE OF THE WORLD'S LARGEST PRODUCERS OF INDUSTRIAL AND COMMERCIAL LIGHTING FITTINGS

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Gear tray supported in temporary position.



## Rolled thread screws

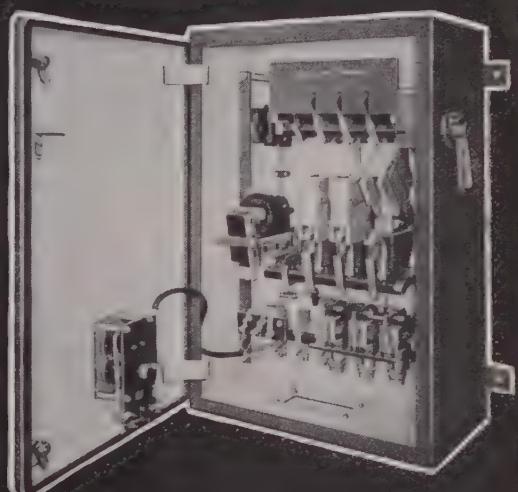
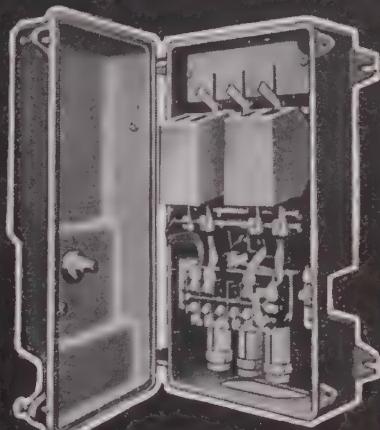
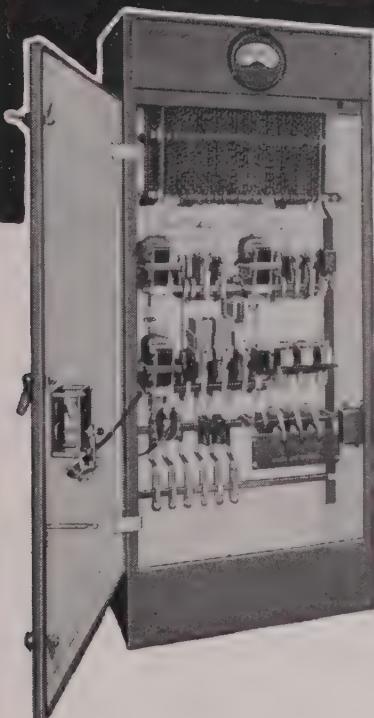
Take no chances about your supplies of Rolled Thread Screws—specify ORMOND and so make sure of both quality and quantity—delivered right on time and straight from our extensive stocks. For your individual requirements, we will gladly submit special quotations. Send for lists, which in addition to detailing Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, also feature Grub-screws, Nuts, All-threads, Hexagon Bolts and Set-screws turned from bar and Cold Headed Grades "A", "B" and High Tensile. The repetition parts range covers single and multi-spindle automatics up to  $1\frac{1}{4}$ " diameter.



THE ORMOND ENGINEERING CO. LTD.

Ormond House • Rosebery Avenue • London, E.C.1 Telephone: TERminus 2888 Telegrams: "Ormondengi, Cent"

# "ERSKINE HEAP" CONTACTOR STARTERS



We manufacture contactor starters of the direct-on, star delta or auto-transformer pattern for controlling squirrel cage motors, and of the stator and rotor pattern for controlling slip ring motors.

All overloads are of the accurate solenoid type, and above 10 H.P., powerful magnetic blowouts are incorporated. The contactors are mounted on bakelised steel bars and constitute a completely independent unit ready to be mounted in any frame, case or cubicle, and for any combination of equipment.

All contactors can be supplied either with or without fully interlocked isolating switch. All accessories such as 'hand' 'off' 'auto' switches, control circuit fuses and instruments can be mounted as required, and the starters can be arranged suitable for 'local' or 'remote' control or to be operated by float switches, pressure gauges, thermostats, etc.

**WE ALSO MANUFACTURE**  
**ALL TYPES OF HAND-OPERATED**  
**AIR-BREAK & OIL-IMMersed**  
**STARTERS AND MOTOR**  
**CONTROL GEAR**

The multi-motor panel type Switchboard illustrated (right) is one of many supplied to one of the leading petroleum companies.



**ERSKINE, HEAP & CO LTD**

SWITCHGEAR SPECIALISTS

Head Office & Works  
BROUGHTON, MANCHESTER (7)

London Office

GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

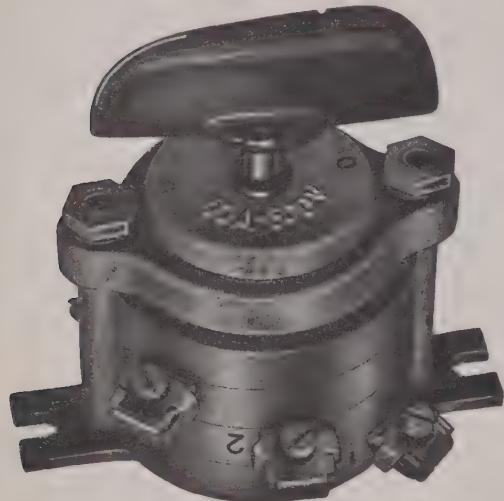
BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

## SHIMWELL, ALEXANDER & CO. LTD.

VOIGT and HAEFFNER PACKET SWITCHES

Original Manufacturers

10 to 600 Amps up to 600 Volts AC/DC in full range of switching sequences. All contacts silver plated. MELAMINE non-track Insulation. Also contactors, circuit breakers, continental pattern, plugs, sockets, fuses, etc.



SHIMALERT FLAMEPROOF SIGNAL HORN

REF. SAH 32A. Reliable, penetrating warning device. 250 yards range in still air. Cast iron case with one or two cable entries. Drilled and tapped up to 1" conduit,  $\frac{3}{4}$ " B.S.P. or  $\frac{3}{4}$ " A.P.I. threads. AC or DC. 6-250 volts. Also available in weatherproof die cast aluminium case.

REF. SAH. 33.

**SHIMWELL, ALEXANDER & CO. LTD.**

THE MARINE ELECTRICAL PEOPLE

20 BEVIS MARKS, LONDON, E.C.3

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Telegrams: Shimalec, Fen, London

FOR  
CABLE  
SPIKING  
WITH PERFECT  
SAFETY

USE THE  
REMOTELY  
CONTROLLED  
CARTRIDGE  
OPERATED

## 'ACVOKE' CABLE SPIKING GUN



Following highly successful "Live" Spike tests bulk quantities have now been supplied as standard equipment to C.E.G. Board; the many Area Boards; as well as to Supply Companies; Dock and Rail Authorities; Atomic Energy Establishments; Utility and Commercial Undertakings at Home and Abroad. Price £65. 15. 0 NET. Ex Works. Sole Manufacturers.

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PLASTIC MOULDINGS

FREDERICK W. EVANS LTD.  
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Sculptured mask from ancient Mexico



*Give us a  
shout!*  
when you need  
**ELECTRIC CABLES**

RIST'S Cable Applications include:

Aircraft	Domestic Appliance	Instrument	Shot Firing
Automobile	Electronics	Lighting	Switchboard
Bell	Heating	Loudspeaker	Telephone
Compensating	Housewiring	Microphone	Thermocouple
Connection	Ignition	Pendant	Welding
Control	Industrial	Radio Frequency	Workshop

SEND YOUR ENQUIRIES ALONG NOW!

**RIST'S WIRES & CABLES LTD**

LOWER MILEHOUSE LANE • NEWCASTLE STAFFS

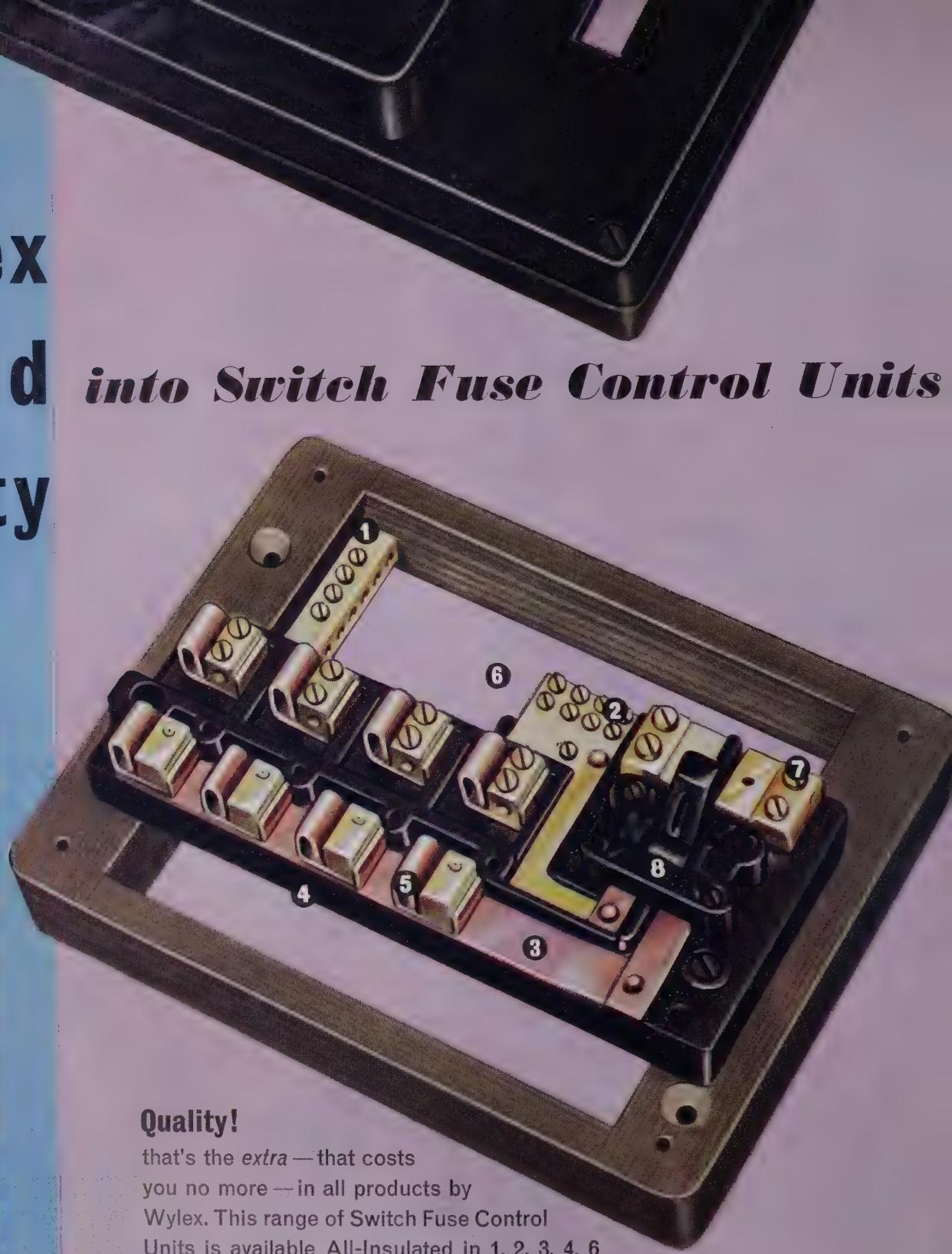
Sole London Distributors for Housewiring Cables and Flexibles:

LYMELITE ELECTRICAL INDUSTRIES LIMITED, 134 Pentonville Road, London N.1

TERminus 9631/2

# Wylex build quality

- 1 Earth Bar always provided.
- 2 All Terminals easily accessible.
- 3 High grade electrolytic copper Bus-Bar.
- 4 Current-carrying components mounted on non-track Mouldings.
- 5 Fuse Contact Clips of Special design to ensure positive contact.
- 6 Ample wiring room.
- 7 Screws have domed ends — cannot cut into cables.
- 8 Incorporates WYLEX Switch — proven by years of extensive service.



## Quality!

that's the *extra* — that costs you no more — in all products by Wylex. This range of Switch Fuse Control Units is available All-Insulated in 1, 2, 3, 4, 6 and 8 way and Metalclad 3, 4, 6 and 8 way, 250v. S.P.&N. Especially easy to stock and make up, to any combination of fuses — rewirable or cartridge. Features the *proven* WYLEX switch with silver-to-silver contacts and sturdy mechanical components.

## Wylex Distribution Boards

contemporary to the range of Switch Fuse Control Units available in 4, 6 and 8 way. All-Insulated and Metalclad.



## Wylex build quality into . . .

SWITCHES · SWITCHED SPUR BOXES · PLUGS & SOCKETS  
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GEORGE H. SCHOLES & CO. LTD. Wylex Works, Wythenshawe, Manchester 22

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This is the supremely practical  
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Sheet Metal Manufacture to fit 16" open fireplace. Finished stoved hammered silver with chrome plated treatment. Log effect flicker flame. 1 or 2 kw. A.C. only. Voltages 200/220, 230/250. Two switches. Flat type elements. 6 ft. of flex. Chromium plated fireguard to British Standards. Manufactured to B.S.I. 1670. Dimensions: width 19" height 6" depth 8½" from front of fireplace to fire back. Fireplace opening-16" narrowing to 9½" at the fire back.

**£12 . 19 . 9 plus £2 . 7 . 6 Purchase Tax**

Produced to  
B.S.I. standards



elegant and  
economical—the

## Flamingo

Look at the host of star features incorporated — Fibre glass coal and cosy flame flicker effect. Smooth satin-silver finish with bright relief. Chromium reflectors. Safety fireguard conforming to Government regulations. Works on standard voltages, 1 or 2 kw. with two independent switches. Size 19" x 24" x 11" plus 6ft. 3 core flex.

**£10 . 15 . 6 plus £1 . 19 . 5 Purchase Tax**  
With log effect £11 . 10 . 6 Tax £2 . 2 . 2

### The 'SWALLOW'

—absolutely unrivalled in its class!

Manufactured from sheet metal. Stoved hammered nigger brown back. Front-hammered silver with chrome treatment. 1 or 2 kw. A.C. only. Two switches. Pencil elements. Chrome plated reflector and guard. Flicker flame coal effect. Manufactured to B.S.I. 1670. 21½" high, 19" wide, 10" back to front.

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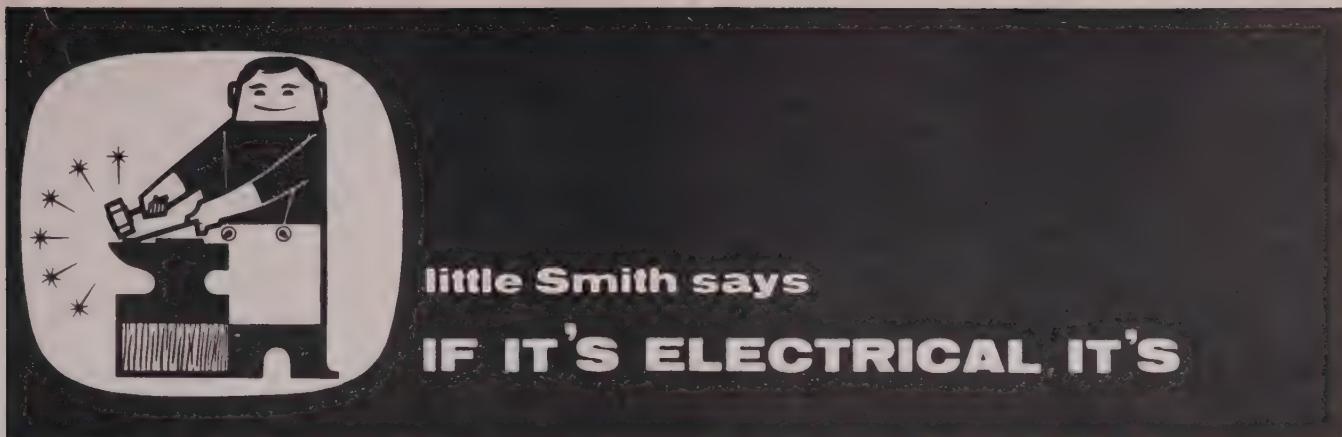
DUDLEY, WORCESTERSHIRE.

Tel: Dudley 52691/3

**STAND U3 A.S.E.E.  
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## **Smithlite products include**

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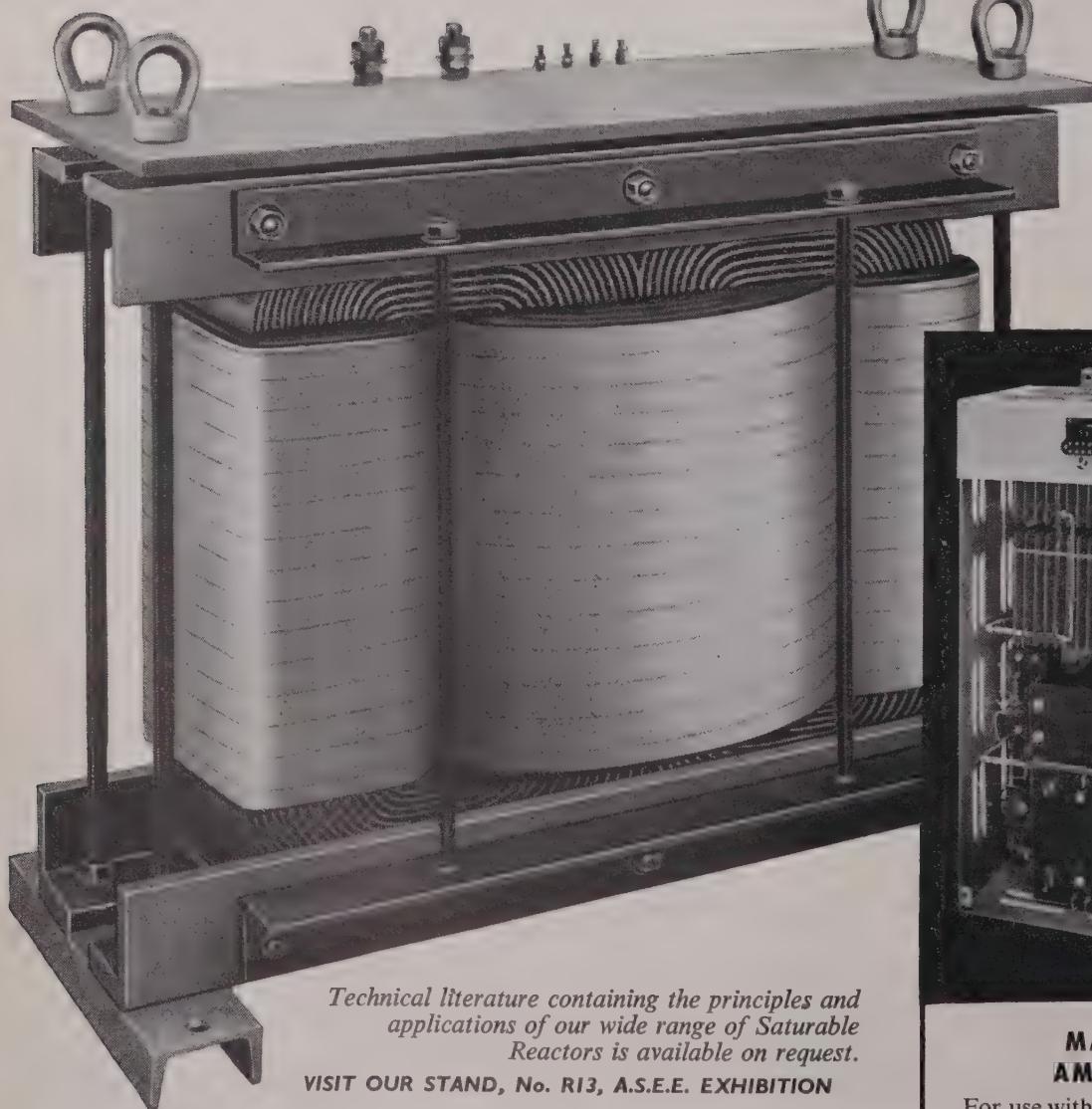
#### **Branches at:-**

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STAND U3, A.S.E.E.  
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 EARLS COURT, MARCH 21-25



# STANDARD SATURABLE REACTORS **TRANSDUCTORS**



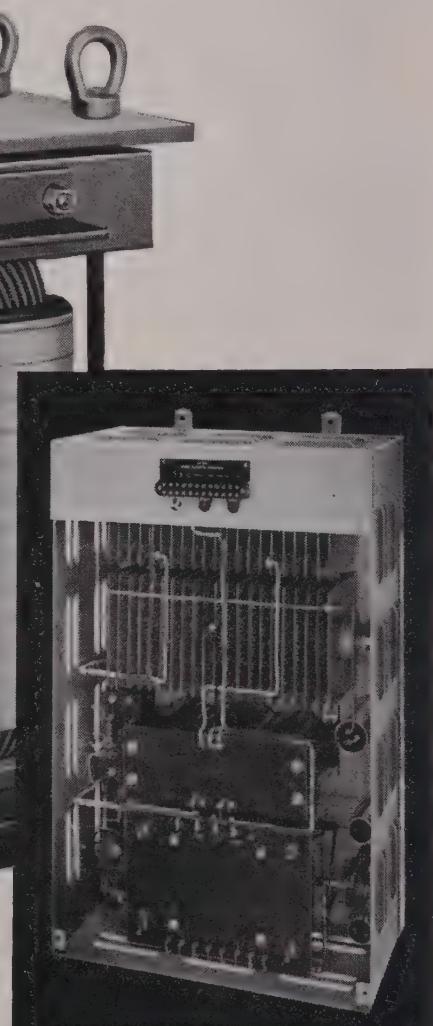
*Technical literature containing the principles and applications of our wide range of Saturable Reactors is available on request.*

VISIT OUR STAND, No. R13, A.S.E.E. EXHIBITION

Haddon "STANDARD" Saturable Reactors — Transductors operate from conventional A.C. line Voltages and provide a choice of D.C. Voltages for Control Windings. Selected from a wide range of individually designed and manufactured SPECIALS over past years. The HADDON STANDARD RANGE enables the discerning engineer to select STANDARD EQUIPMENT for Specific application.

416 standard single phase designs cover the range 1 kVA to 300 kVA.

They provide the best method of stepless control in both long term economies and high performance standard.



## MAGNETIC AMPLIFIERS

For use with Saturable Reactors Haddon manufacture a standard line of Magnetic Amplifiers.

Operating from 200/250V 50/60 c/s single phase supply, with input of 0.5 mA. DC in 2000/8000 ohms.

*Illustrated above is the 1000W. Magnetic Amplifier.*



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**60w. 1/8½d. 100w. 1/11½d. 150w. 2/10d. inc. P. Tax**



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(LD3289)



## *Join the Delanco strip club!*

### *...and cover yourself against production losses*

If you use insulating materials, you probably buy in sheet form. In most cases sheets are then cut into strips ready for processing through press tools. The Delanco organisation supplies insulating materials in sheet, Bakelite, Vulcanized Fibre, Press-pahn, Pressboard etc., but we also

supply in strip form precisely cut to close tolerances, and the following points may be of interest:

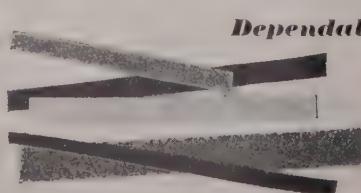
- 1 In cutting strips, for instance in bakelite, we obviate surface cracking and edge-fracturing of the laminae usually brought about by the average guillotine.
- 2 A uniform width to the length of the strip, eliminating trouble in the press shop through occasional strips jamming in the tool.
- 3 No charge for waste, we charge only for the nett quantity of strips cut. The waste in cutting strips is an average of 5% even more

when strips cut are narrower than 2".

4 We have a special lay-out for speedy delivery, and the extra cost to you over the price of the sheet would be negligible in comparison to your own.

5 A trial order in strip form would, we feel sure, be amply repaid by the money saved by your using the Delanco specialized strip-cut service. Why not try it anyway?

If you use roll-feed presses we can supply Delanco, Leatheroid, Vulcanized Fibre, Press-pahn and Kraft paper in continuous coil. Check these points with your production dept.



*Dependable*

# **Delanco**

for Electrical Insulation

Anglo-American Vulcanized Fibre Co. Ltd.,  
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Delanco Works, Leonard St., London, E.C.1.





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P & B Tape is used wherever exceptional resistance to abrasion is essential—in mines, power houses, transformer stations, telegraph and telephone installations. It far exceeds the requirements of the British Standard (No. 1078/1954), gives complete insulation. When you need the supreme heavy duty insulating tape, use P & B. In any width from  $\frac{1}{2}$  inch.

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Instant-start control gear in Miniature fluorescent fittings.  
Cast 2-ft. fluorescent fitting—'recessable' and weatherproof.  
Chokes inside flame-proof fittings.

A.S.E.E. EXHIBITION

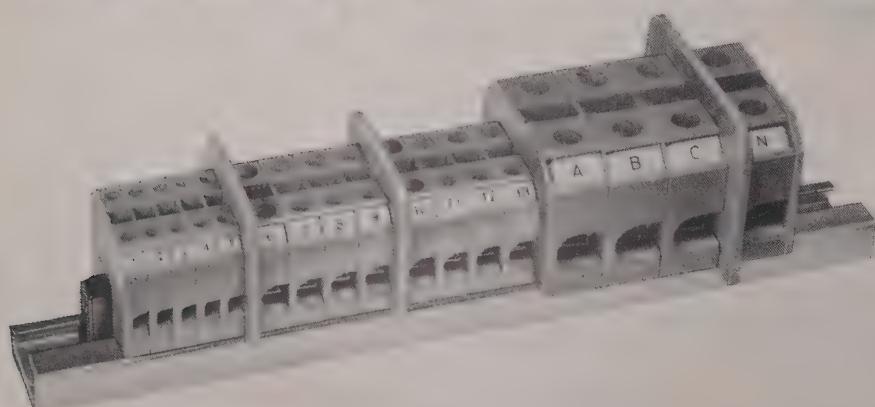
## **Victor Stand No.K19**

VICTOR PRODUCTS (WALLSEND) LTD. Wallsend-on-Tyne, England. Tel: WALLSEND 628331 (6 lines).  
London Office: 1327 London Road, Norbury, S.W.16. Tel: Pollards 0077 (3 lines).

**KLIPPON**  
**KLIPPON ELECTRICALS LTD.**  
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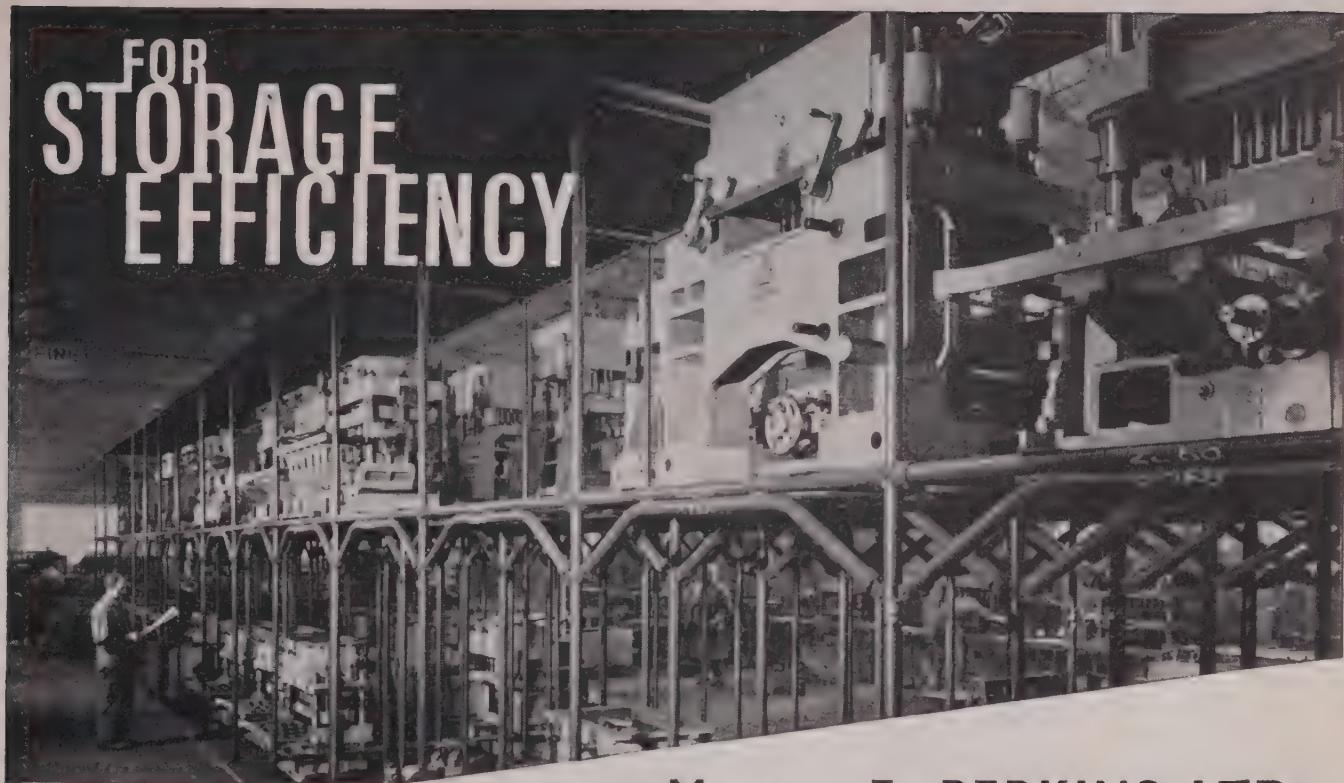
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Your Terminal Problems will be answered by a visit to  
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- 39 Standard types 15-600 amps.
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The Kee Klamp System saves space, manpower...and streamlines the whole process of materials handling and storage.  
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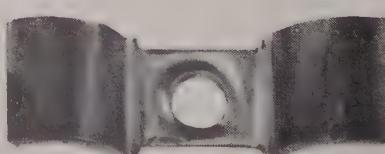
# ELMET contacts eliminated a “more or less endless job”

**THE UNRETOUCHED PHOTOGRAPHS** below show the two actual sets of contacts referred to in this letter from The Solway Pre-Cast Products Ltd. Those in the upper picture are plain contacts, while the lower set have ELMET facings. Please ask for Publication No. 62.

**There is an ELMET contact metal for every purpose**



**PLAIN contacts: "three to four months was the maximum..."**



**ELMET faced: "...three and a half years of continuous use"**

**METRO-CUTANIT**  
LIMITED

LIMITED GRAPPENHALL WARRINGTON LANCASHIRE

Broadway/mc6

Telephone: Grappenhall 906/8

The Solway Pre-Cast Products Ltd  
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PRE CAST CONCRETE SPECIALISTS & GRANITE CRUSHERS  
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CONCRETE  
STRUCTURES

JSS/VK  
Metro-Cutanit Ltd.,  
Grappenhall,  
WARRINGTON,  
Lancs.  
Dear Sirs,

We have now completed the test run of the switch fitted to our electric hoist using Elmet faced contacts. It is approximately three and a half years since this unit was fitted. This unit is working to continuous operation since that date. This unit has been in capacity, lifting units between 17 and 18 cwt. each.

Since fitting, this switch has given no trouble whatsoever and this is the first occasion that the switch has been inspected, when we removed same to return to Grappenhall.

Previous to your supplying this switch, three to four months was the maximum period before either failure or renewal of the contacts was necessary. The contact failure of the original switch also caused other troubles, as on this unit the magnetic brake is pulled to the one phase, due to burned contact faces, although the main switch is magnetic brake was not faces - we sheared off the end of the motor spindle - due to the happening drum is attached - in fact, before you supplied these special contacts, it was more or less an endless job to keep these hoists running satisfactorily.

In closing, I would mention that immediately before removal of the Elmet-surfaced switch, the contacts had been working perfectly satisfactorily, although the contacts had shown signs of slight burning but this is not excessive and after three and a half hours per day.

Thank you for your co-operation in this matter.

Yours faithfully,

*J. S. Slater*  
For THE SOLWAY PRE-CAST PRODUCTS LTD.  
Managing Director

PRE-CAST CONCRETE SPECIALISTS & GRANITE CRUSHERS

7th August, 1959.

# THE NEW ENBRAY

## THERMAL OVERLOAD AND SINGLE-PHASING RELAY HAS EVERYTHING

0.5 to 50 Amps on  
one relay!

Front-replaceable heaters  
with captive screws — 23  
ratings.

Large, easily wired  
compression clamp  
terminals (will accept  
19/0.064 cable).

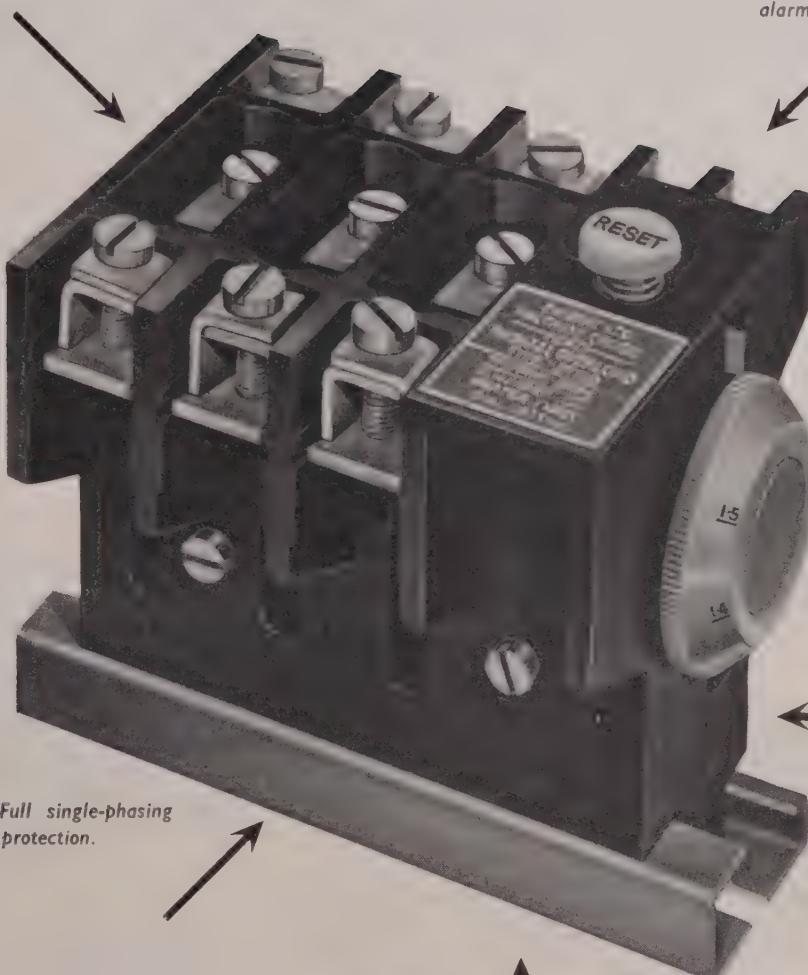
Snap-action trip and  
alarm contacts.

Knob for hand  
reset.

Large calibrated dial  
gives 6 settings.  
1.0—1.5 of heater  
rating.

Full ambient tempera-  
ture compensation.

Quick-change mounting  
relay snaps-in to steel  
channel.



Full single-phasing  
protection.

Shrouded lever for  
immediate change  
from hand to self  
reset.



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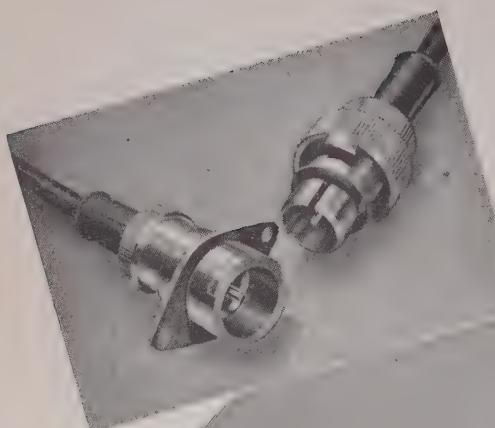
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Telephone : Waltham Cross 22212-5

Telephone : Douglas 1271

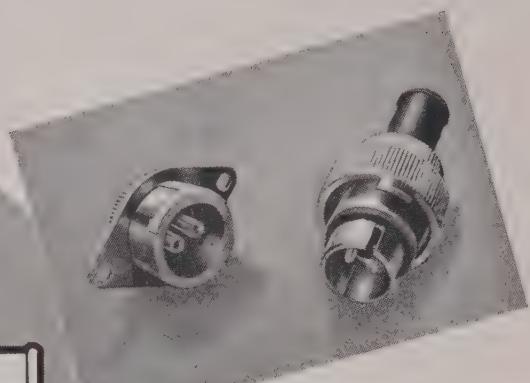
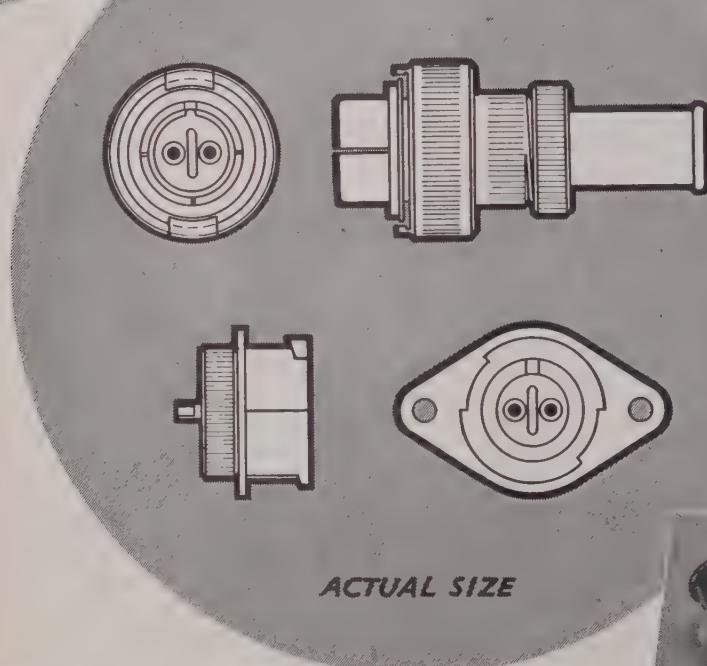
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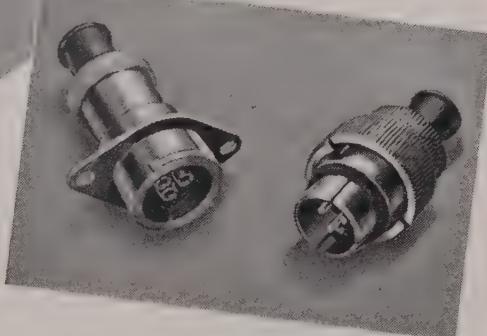
L.788/FP FREE PLUG, Coaxial  
 L.788/CS FIXED SOCKET, Coaxial  
 L.788/BS BULKHEAD SOCKET, Coaxial  
 L.788/FS FREE SOCKET, Coaxial

Nominal impedance:  $75 \Omega$   
 Capacitance of plug and socket measured at 1 Mc/s: 1.9 pF



L.789/FP FREE PLUG, 2-pole  
 L.789/CS FIXED SOCKET, 2-pole  
 L.789/BS BULKHEAD SOCKET, 2-pole  
 L.789/FS FREE SOCKET, 2-pole

Nominal impedance:  $100 \Omega$   
 Capacitance of plug-and-socket measured at 1 Mc/s:  
 Conductor/Conductor, 1.4 pF  
 Conductor/Screen, 2.3 pF



L.790/FP FREE PLUG, 3-pole  
 L.790/CS FIXED SOCKET, 3-pole  
 L.790/BS BULKHEAD SOCKET, 3-pole  
 L.790/FS FREE SOCKET, 3-pole  
 Capacitance of plug-and-socket measured at 1 Mc/s:  
 Conductor/Conductor, 2.0 pF  
 Conductor/Screen, 2.7 pF

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A dirt- and water-proof cover for all fixed members;  
 Supplied with captive chain.

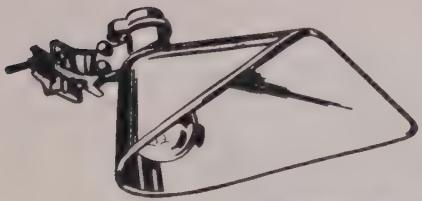
Most "Belling-Lee" products are covered by  
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List No. 890  
'Realux' Overhead Mounting model, for G.L.S. or M.A./V. lamps.

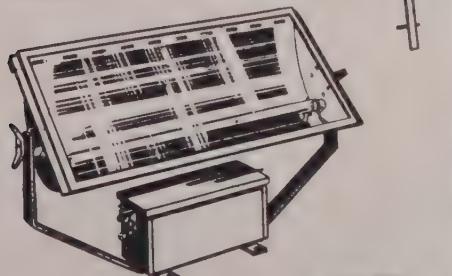


List No. 140  
Downward lighting Sodium Lantern for wall or pole mounting.



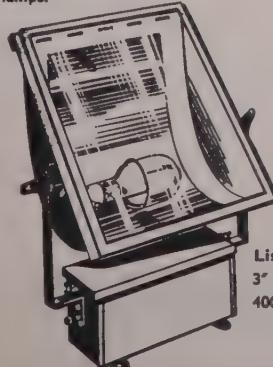
List No. 775  
'Festival' Lanterns for G.L.S. lamps from 100 watt to 1000 watt size.

List No. 920  
Telescopic Tripod for Floodlantern mounting.

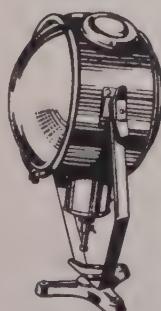


List No. 942  
Upward lighting Lantern for 200 watt Sodium lamp.

List No. 556  
Narrow beam Projectors for 500 watt to 1,500 watt G.L.S. lamps.



List No. 1231  
3" focus Lantern for 400 watt MBF/U lamp.



## YOUR FLOODLIGHTING PROBLEM



Our Illuminating Engineering Department is at your service for the preparation of floodlighting schemes.

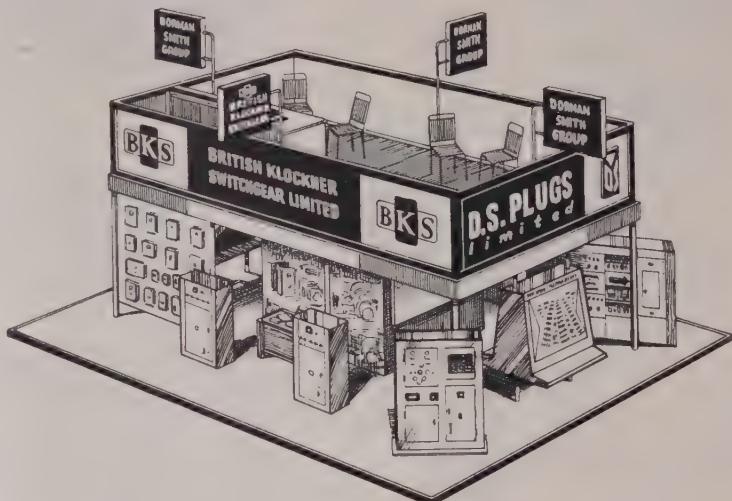
# R E A L

R.E.A.L. IS A REGD. TRADE MARK

## will have the answer

**Stand No. E 5**  
**at the A.S.E.E. Exhibition**  
**Earls Court**  
**March 21st—25th**

**ROWLANDS ELECTRICAL ACCESSORIES LIMITED,**  
**R.E.A.L. WORKS, BIRMINGHAM, 18**



# FIRST



Modern design features, so characteristic of Dorman products, are again much in evidence at the Exhibition. The Company's standardised systems of switchboard building ensure competitive, speedy erection of Cubicle and Ironclad type boards either at works or on site. Cubicon and Dorman systems give contractors the facility for building complete switchboards on site within a few hours of receipt of components.

Loadmaster Miniature Circuit Breakers, individually, in distribution boards, consumer units and in combined units with TS switches, are also on show. This display represents the most comprehensive range of M.C.B. available in Britain and emphasises Dorman superiority in this field. Loadmaster breakers are made in ratings up to 60 amp. S.P., D.P. and T.P.

Domestic Consumer Units up to 10-ways, with 60 or 100A mainswitch, provide a modern alternative to fuse boxes and a ready means of cutting maintenance costs.

The compact, adaptable Loadcentre distribution system incorporating moulded case circuit breakers brings the advantages of breaker protection to circuits rated up to 400 amps.

Other Dorman products on show include 'TS' switchgear up to 750A., H.R.C. cartridge fuse links, distribution fuse boards, prismatic lighting fittings and electrical accessories.

**MESSRS. DORMAN & SMITH LTD., Preston, Lancs**  
Telephone: Preston 86785 (6 lines).



During the past year the Company has increased considerably its range of industrial plugs, sockets and connectors. These, together with many new developments for use in hospitals, schools and technical colleges, provide a comprehensive range which warrants the close attention of architects, consulting engineers and all whose concern it is to find exactly the right equipment for the particular application they have in mind. The answers to such problems are to be found on the D.S. Plugs stand and in the Company's ability to quote for many special requirements based on a diverse range of unique stand products. Particularly worthy of mention are the highly adaptable Bench Distribution Units, samples of which can be seen on Stand H.14.

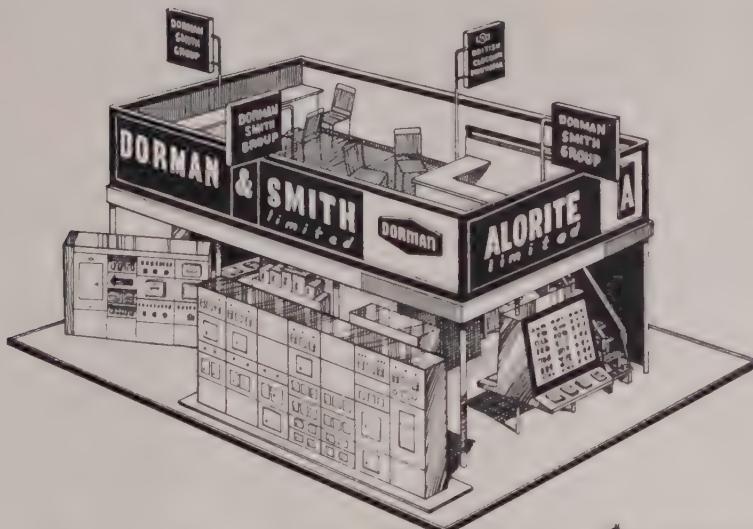
Many domestic electrical accessories are also on show. These include plugs and sockets to B.S.1363, Cooker Control Units, Slow-Break switches up to 100A D.P. and, as a result of a demand from all quarters, a new shaving adaptor made specifically for use with the well-known D.S. round fused-pin range of plugs and sockets.

#### **MESSRS. D.S. PLUGS LTD.**

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# DORMAN SMITH GROUP OF COMPANIES

## Extend



# CALL

**STAND  
H.14**

**B K S**

standing among this Company's exhibits will be automatic control panels built to the customers' own requirements. Special emphasis will be placed on panels for heat distribution control and automatic lift control panels for all types of passenger, service and goods lifts.

These panels are made for motors up to 15 h.p. direct-on-line or 25 h.p. auto stator-rotor starting, also for small passenger or industrial lift controllers, suitable for motor starting direct-on-line up to 2 h.p. on 380/440 volts, 3 phase, or  $\frac{1}{2}$  h.p. on 200/250 volt single phase.

A selection of the range of B.K.S. electrical control equipment, which includes D.O.L. Starters, Reversing Starters, 2-speed Motor Starters, Contactors including models with all Insulated Housings, Thermal Overload Units, Push-Button and Remote Control Stations, Limit Switches and Rotary Switches will also be displayed.

**MESSRS. BRITISH KLOCKNER SWITCHGEAR LTD.**  
Chertsey, Surrey  
Telephone: 3467/8.

**ALORITE**

Visitors will find these exhibits most interesting because on display will be examples of the latest developments together with a range of fuse bodies, insulating beads, insulating materials and a comprehensive display of insulators applicable to many industries.

Alorite ceramics are used in both industrial and domestic products and the technical advisory service of the company is available to all potential users of ceramics.

#### MESSRS. ALORITE LTD.

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A.S.E.E  
ELECTRICAL  
ENGINEERS  
EXHIBITION



VISIT US ON  
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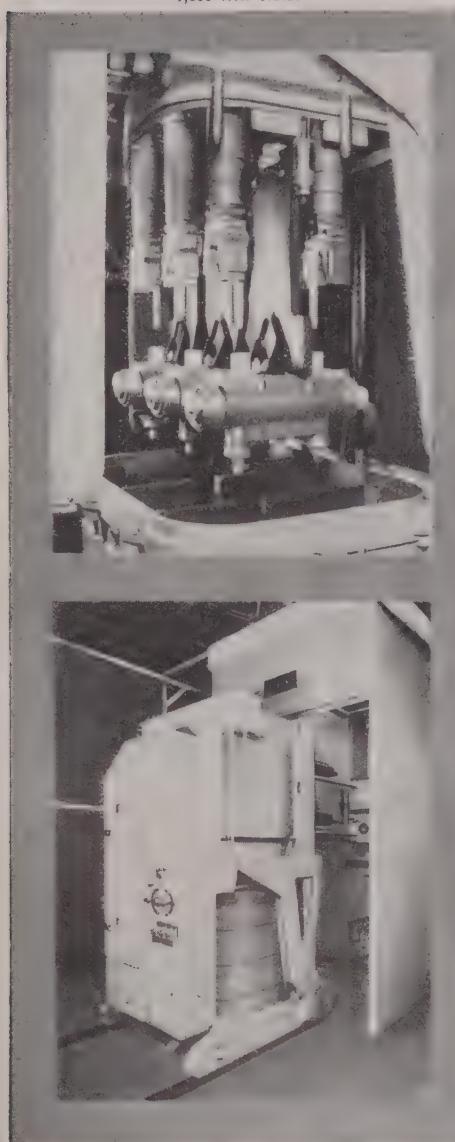
# COMPANIES hearty welcome to all visitors

# HI-VE 18 33kV OUTDOOR METALCLAD SWITCHGEAR

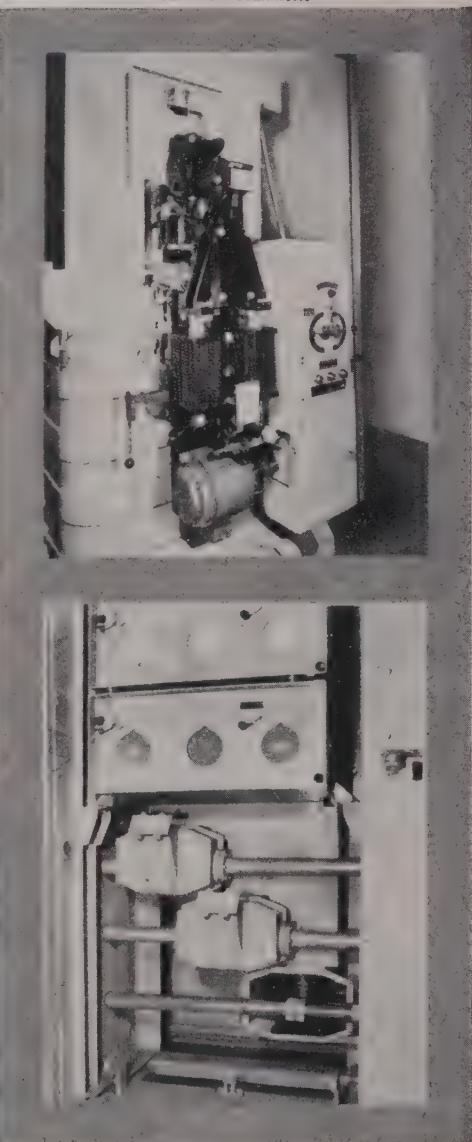
**ADVANCED  
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**METWAY**  
PRODUCTS

REGISTERED TRADE MARK



Fig. Thirty



Fig. Twenty Two



Fig. Thirty One



Fig. Six



Fig. Seven



Fig. Twenty Six



Fig. Twenty One

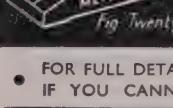


Fig. Two

**METWAY**  
PRODUCTS

REGISTERED TRADE MARK



Fig. Twenty Eight



Fig. Twenty Seven



Fig. Thirty Three



Fig. Five



Fig. Nine



Fig. Eighteen



Fig. Four

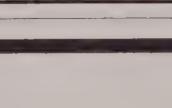


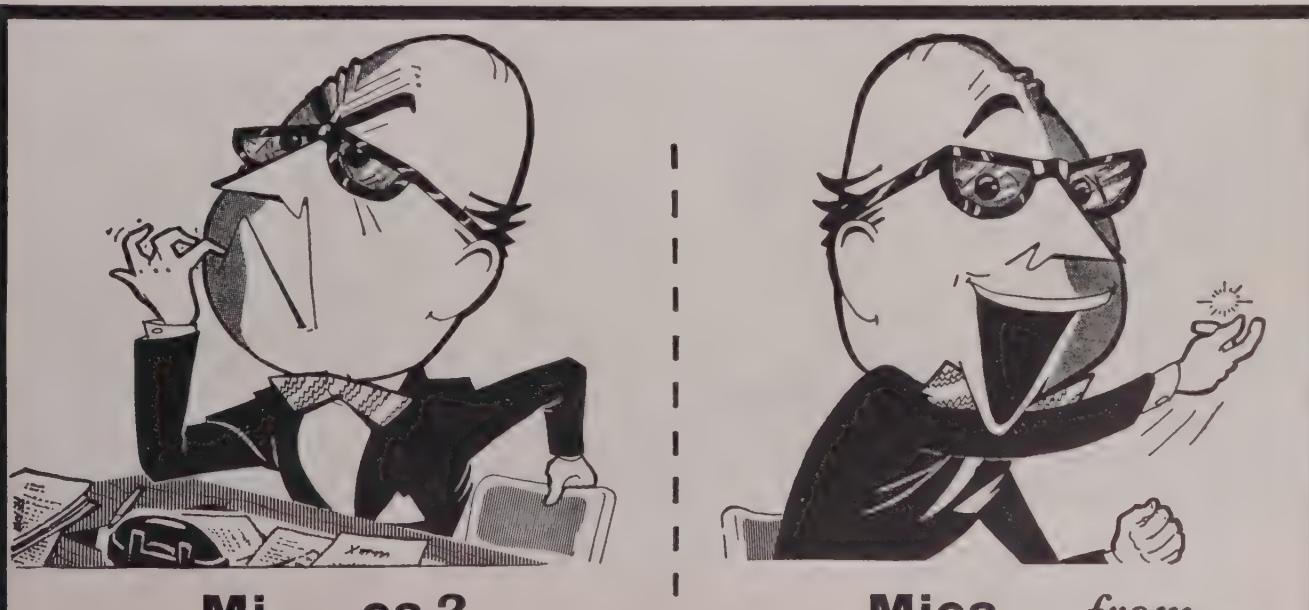
Fig. Eight



Fig. Thirty Four

- FOR FULL DETAILS WRITE FOR CAT. No. NBQ/12 EJ.  
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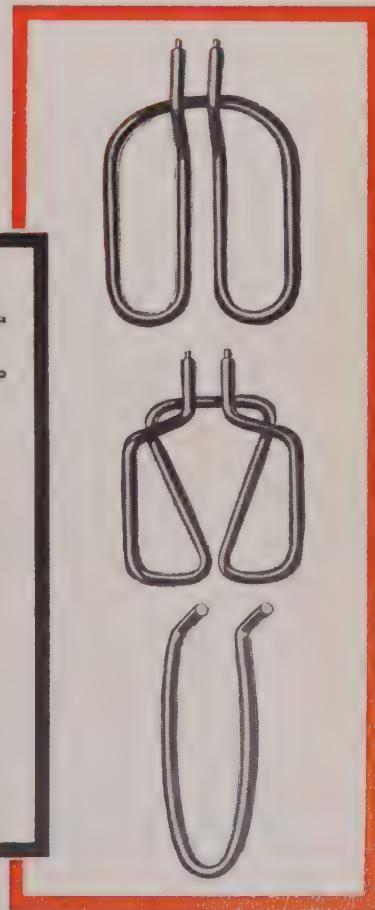
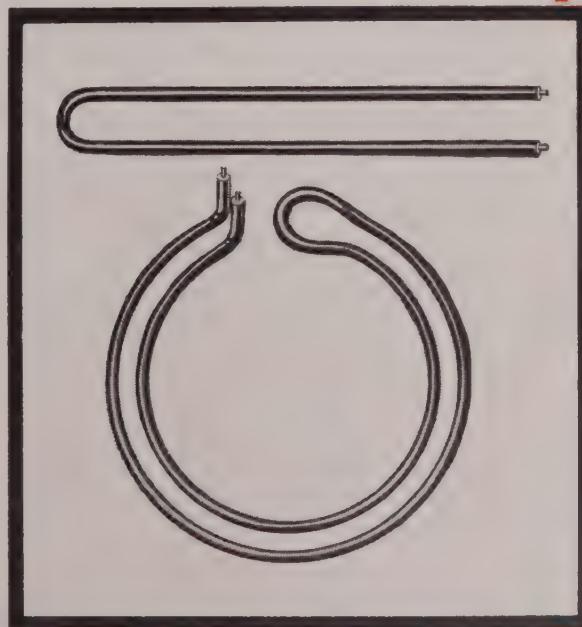
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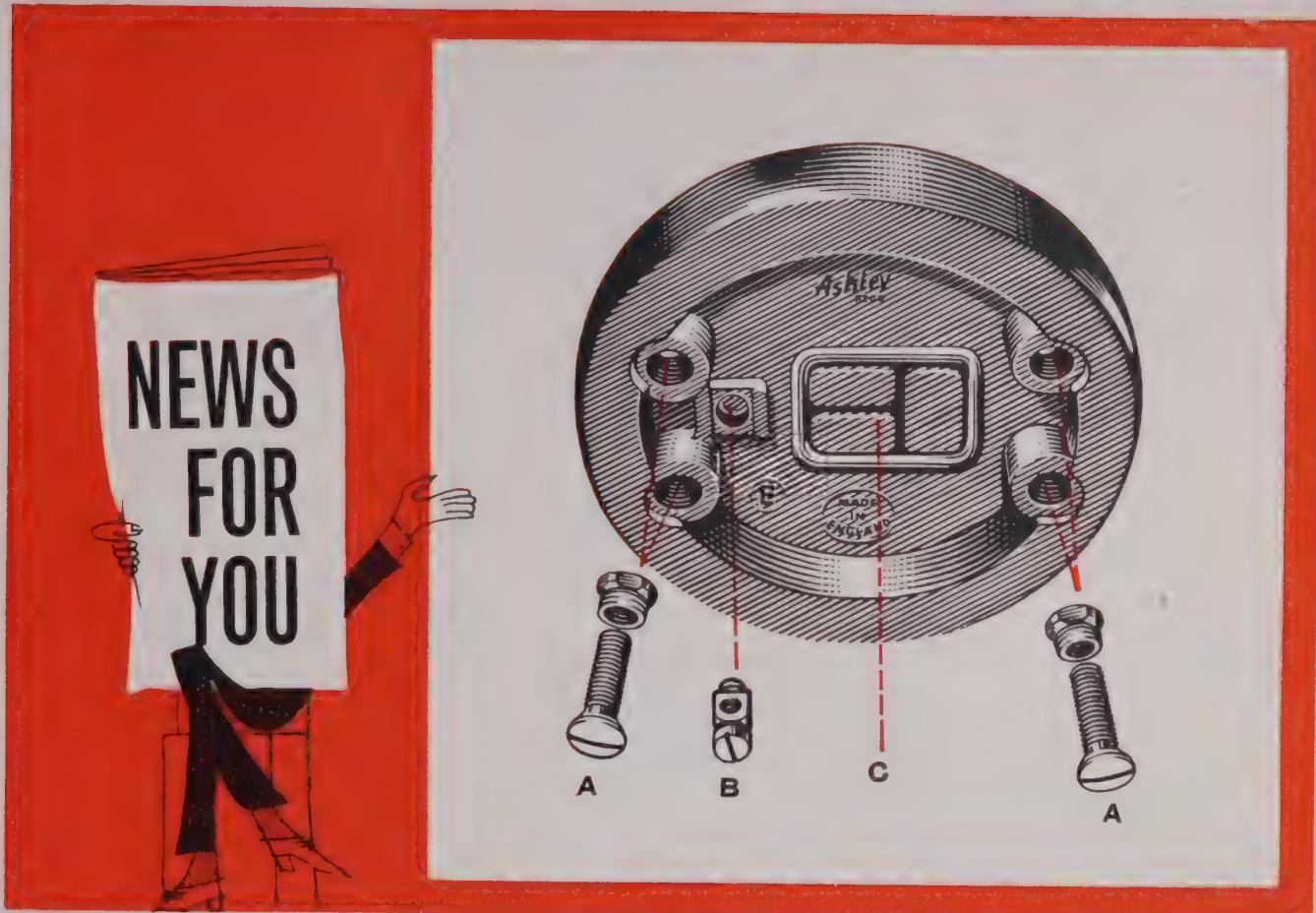
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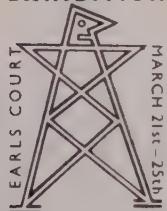
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- A. 2 B.A. x  $\frac{1}{2}$ " Plated fixing screws and tapped inserts—supplied loose.
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  - C. Composite 3 way base Knockout—each section will take 3/029 three core T.R.S., L.A.S., or P.V.C., cable.
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### METHODS OF USE

1. Select fixing holes in 'Polyblok', present inserts to tapered recess and pull fully home by tightening 2 B.A. screw; remove screw and apply 'Polyblok' to working surface with wood screws in holes without inserts. The accessory can then be simply fitted by using 2 B.A. screws. The fitting or accessory can be removed and re-located, or taken down for inspection without risk of damage to plaster surfaces or losing screw grip.
2. Use two wood screws to fix 'Polyblok' in position, then after wiring ends are made off, use two further wood screws through the accessory and the unused pair of holes in the 'Polyblok'. This allows independent location of the accessory, using wood screws.
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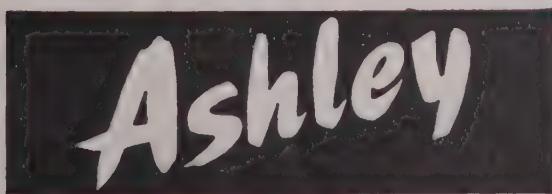
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EARLS COURT  
MARCH 21st - 25th  
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GROUND FLOOR

Cat. No.	DIMENSIONS			KNOCKOUTS		For Accesso- ries of Dia.	Colour	Quan. per Carton	Per Dozen List
	Dia.	Pro- jection	Fixing Centres	Base	Sides				
MB 439	2 $\frac{1}{2}$ "	$\frac{1}{2}$ "	Two 2"	Com- posite	6	2 $\frac{1}{2}$ "	Brown	2 doz.	7/4
MB 440	"	"	"	3 way	"	"	Cream	"	8/-
<b>With Earth Terminal</b>									
MB 439 E	2 $\frac{1}{2}$ "	$\frac{1}{2}$ "	Two 2"	Com- posite	6	2 $\frac{1}{2}$ "	Brown	2 doz.	9/8
MB 440 E	"	"	"	3 way	"	"	Cream	"	10/4
MB FS1	2 BA x $\frac{1}{2}$ " plated fixing screw and insert							2 doz. sets	2/- doz. sets

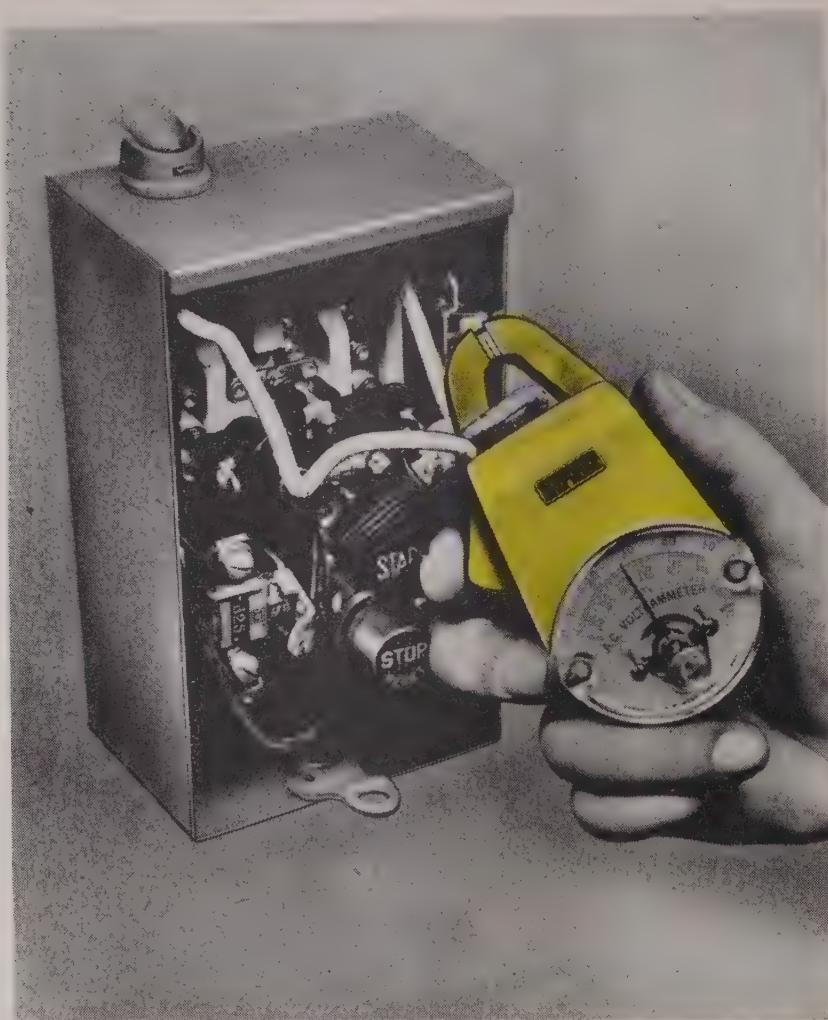
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Does it measure current as well as voltage?	YES	NO
Does it give you full visibility on a graduated reading scale?	YES	NO
Does it fit conveniently in your pocket?	YES	YES
Does it measure within $\pm 3\%$ accuracy?	YES	NO
Does it come in a full line of models to meet different problems?	YES	NO
Does it protect you against shorts and shocks?	YES	YES
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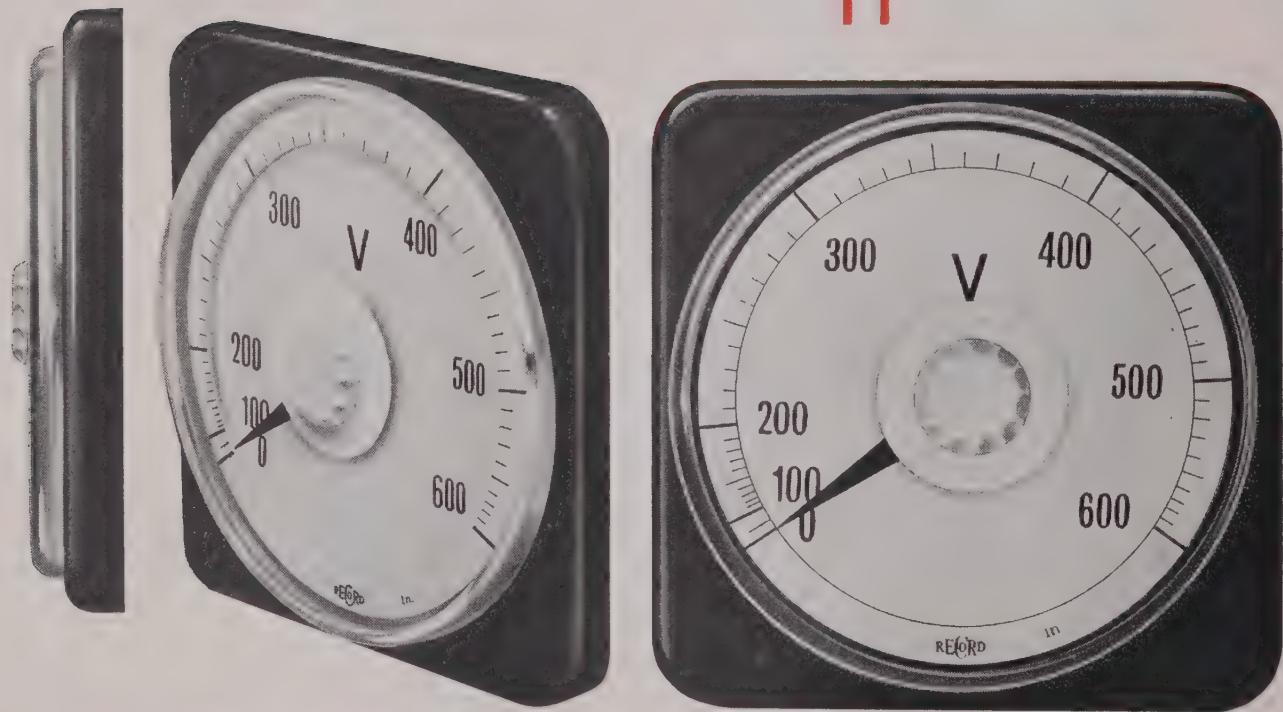
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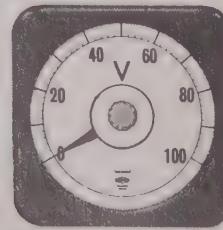
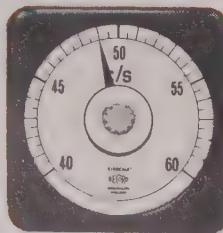
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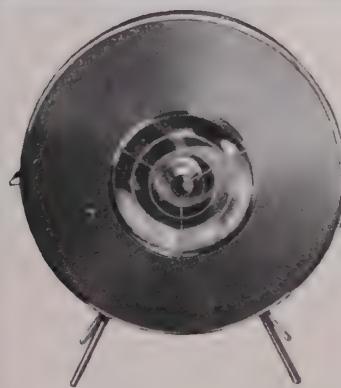
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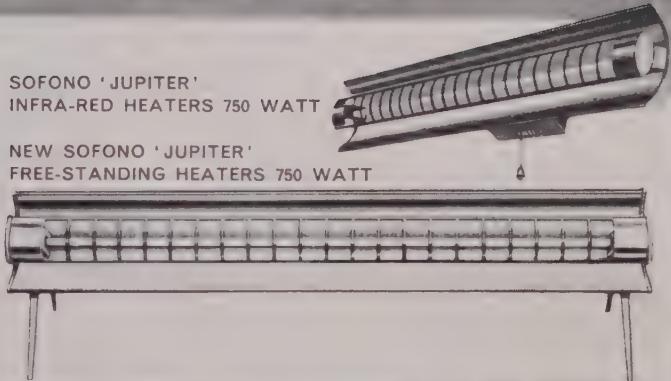
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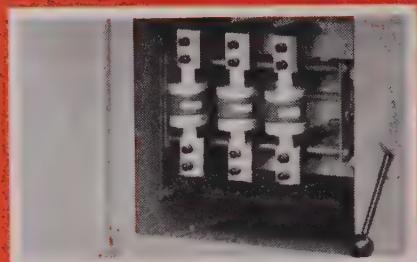
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## SWITCHGEAR LOGIC POINTS TO AEI



*Core and windings of 500-kVA, 3-phase, 11,000/433-volt transformer.*

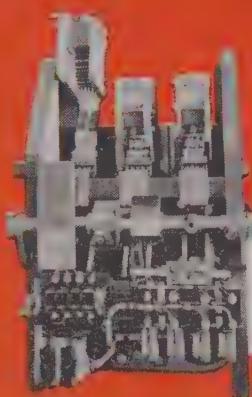


*Type CMC fuse switch unit.*



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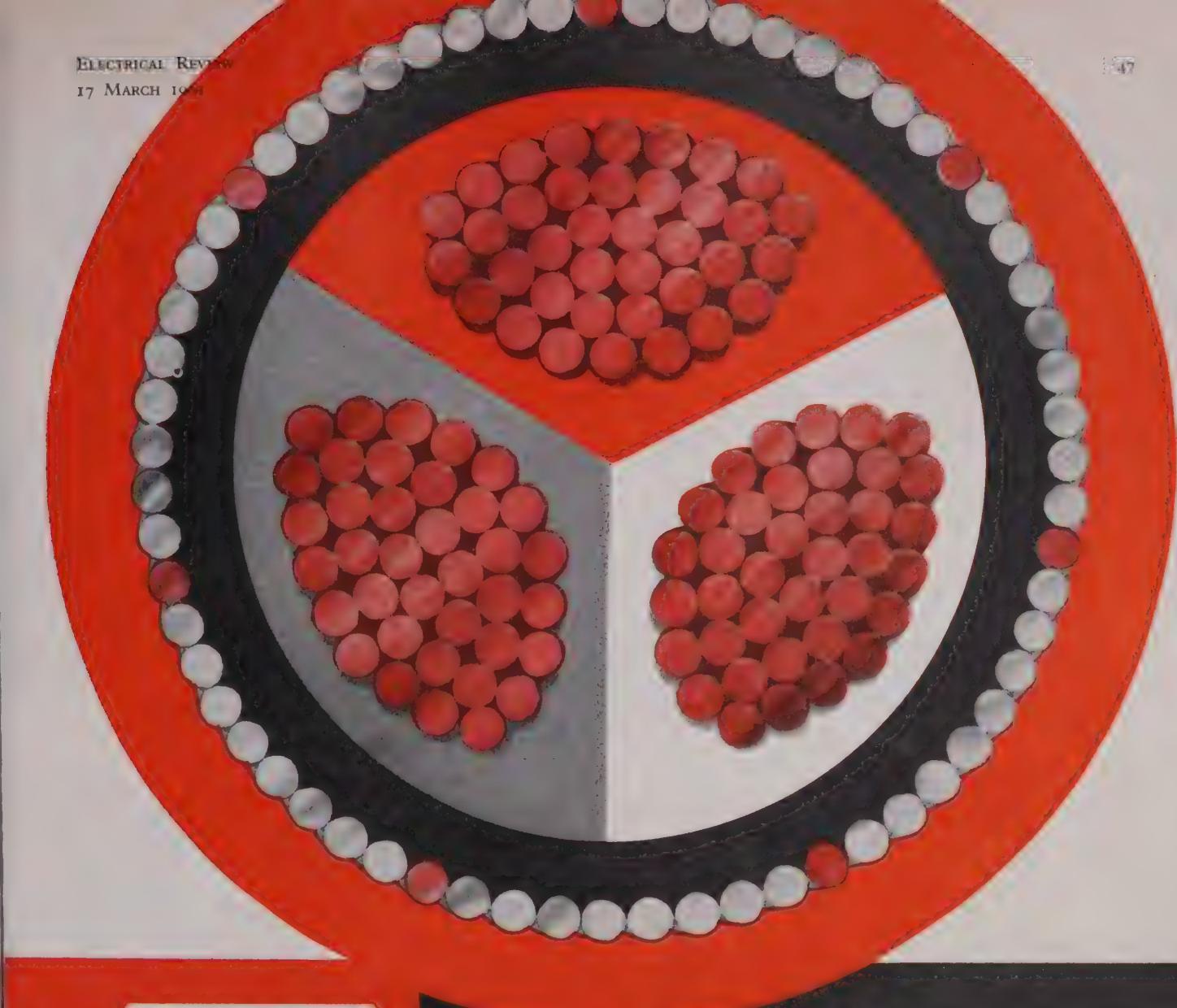
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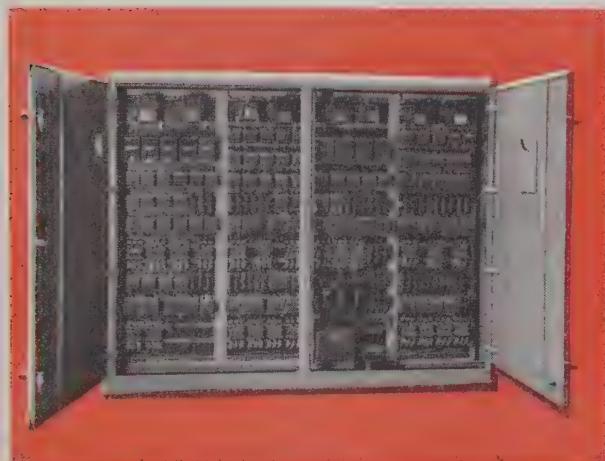
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Control panel for eight-head rotary  
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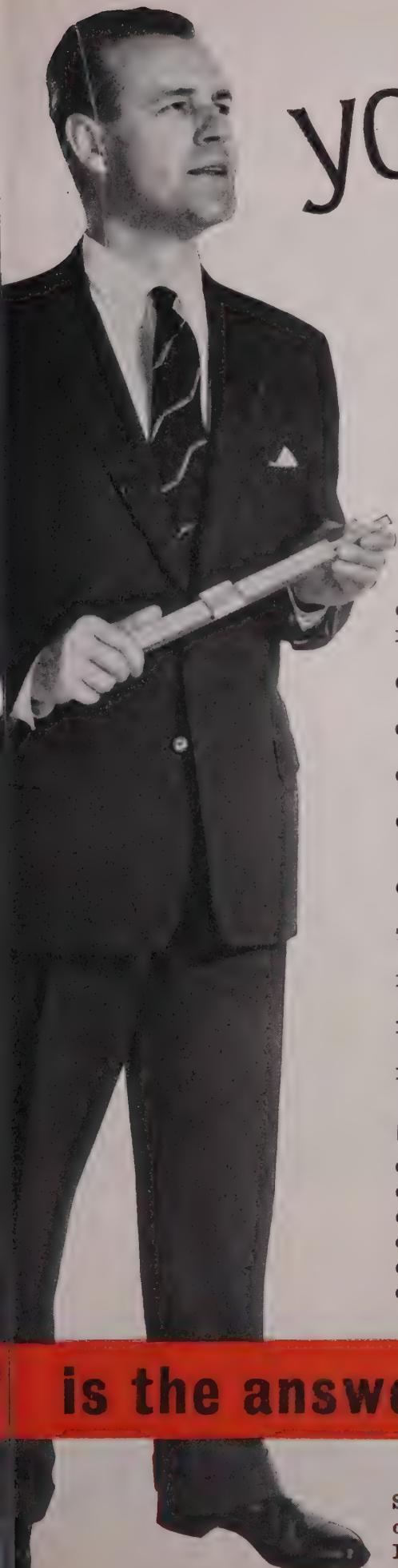
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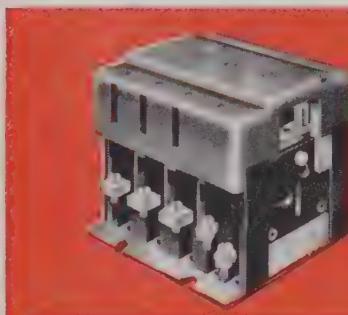
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15, 40 & 100 Amp

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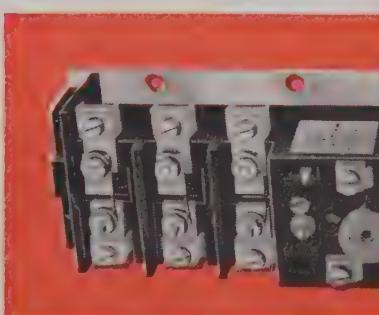
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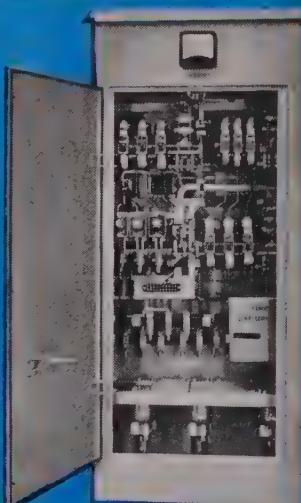
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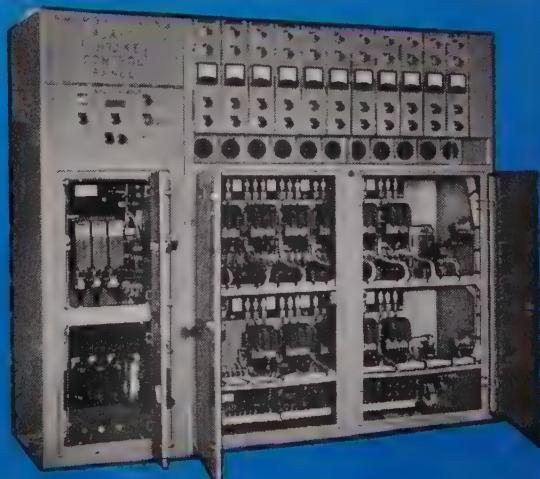


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# STAND N<sup>o</sup> G.10

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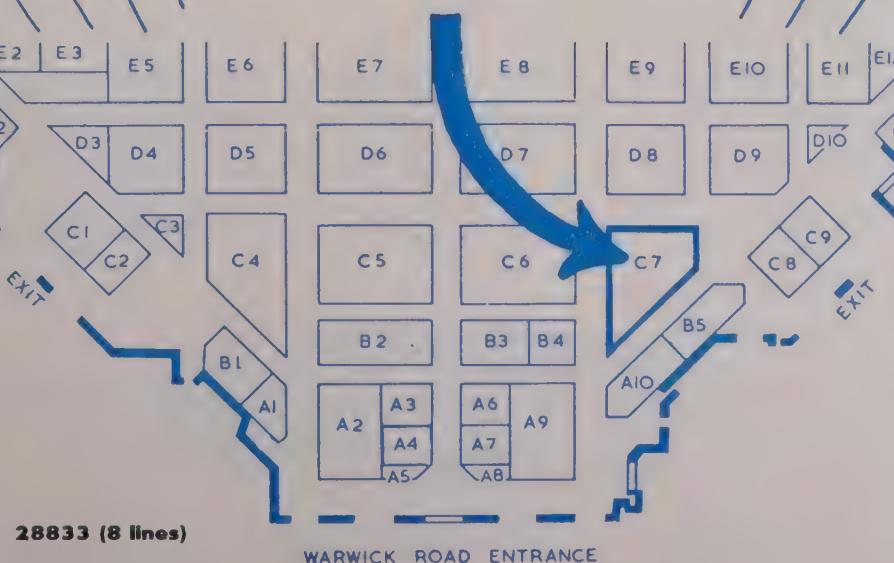
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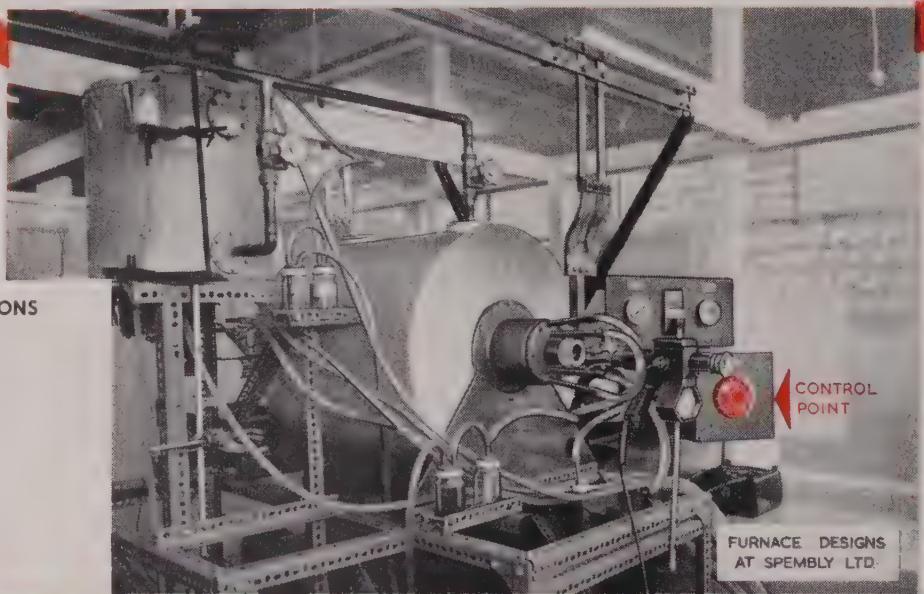
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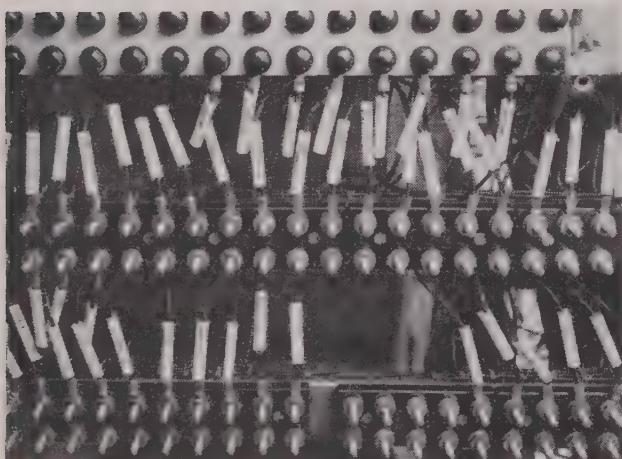
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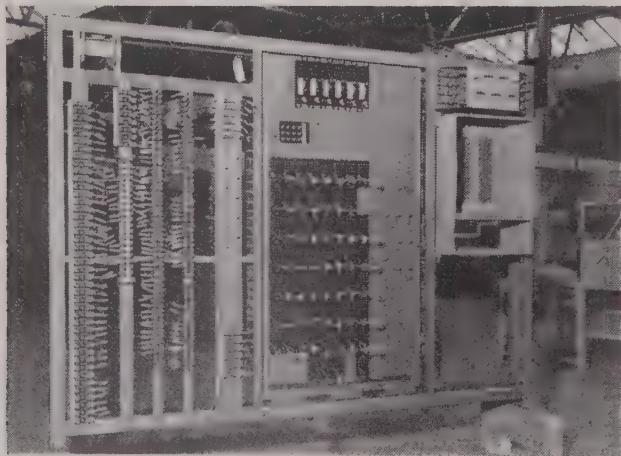


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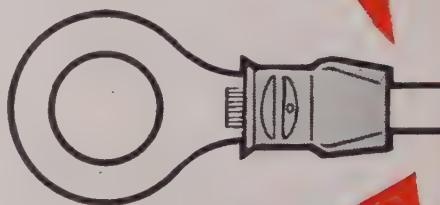
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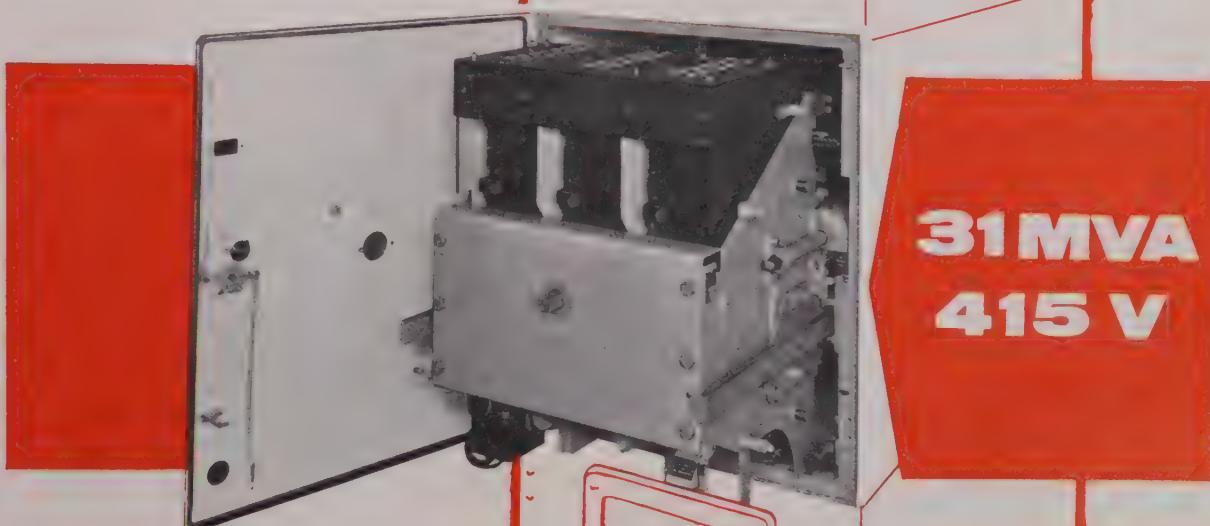
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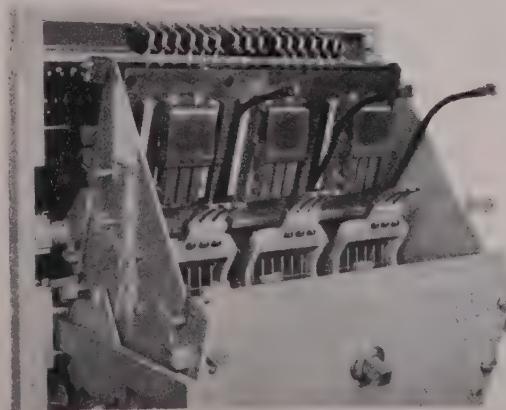
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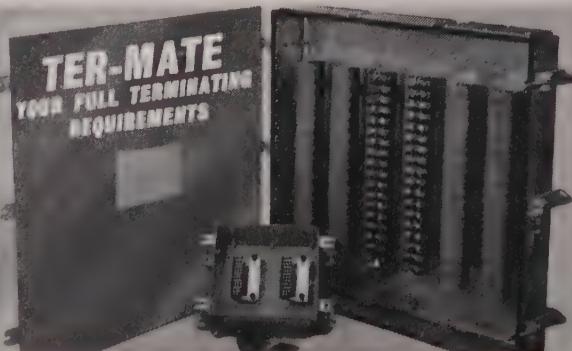


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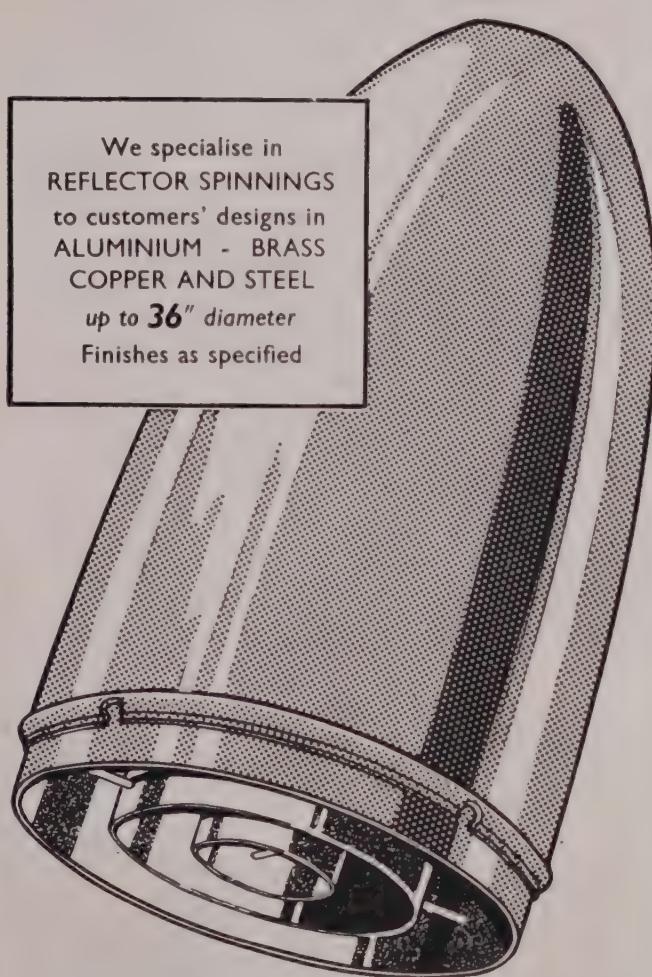
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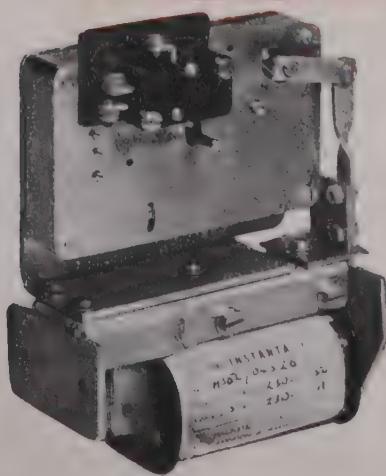
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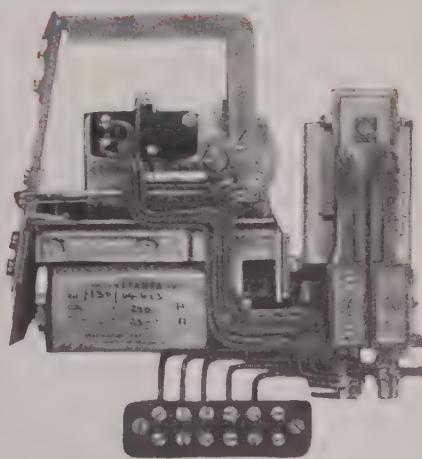
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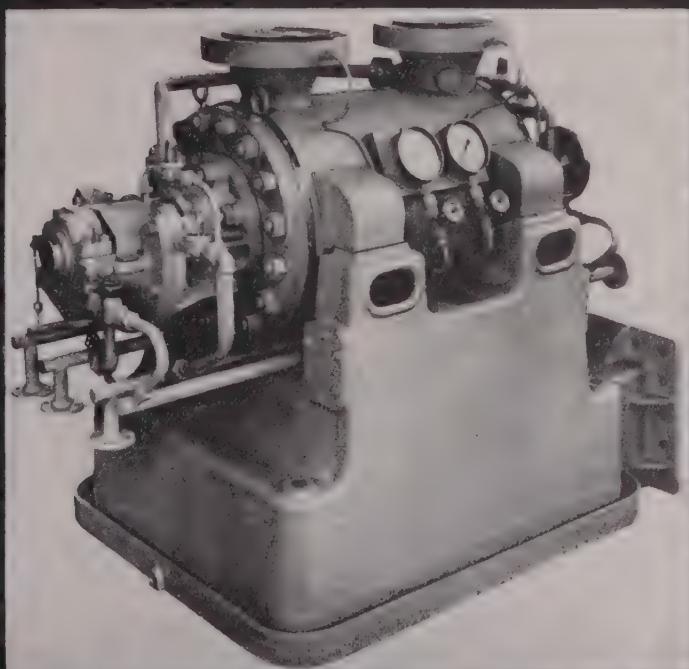
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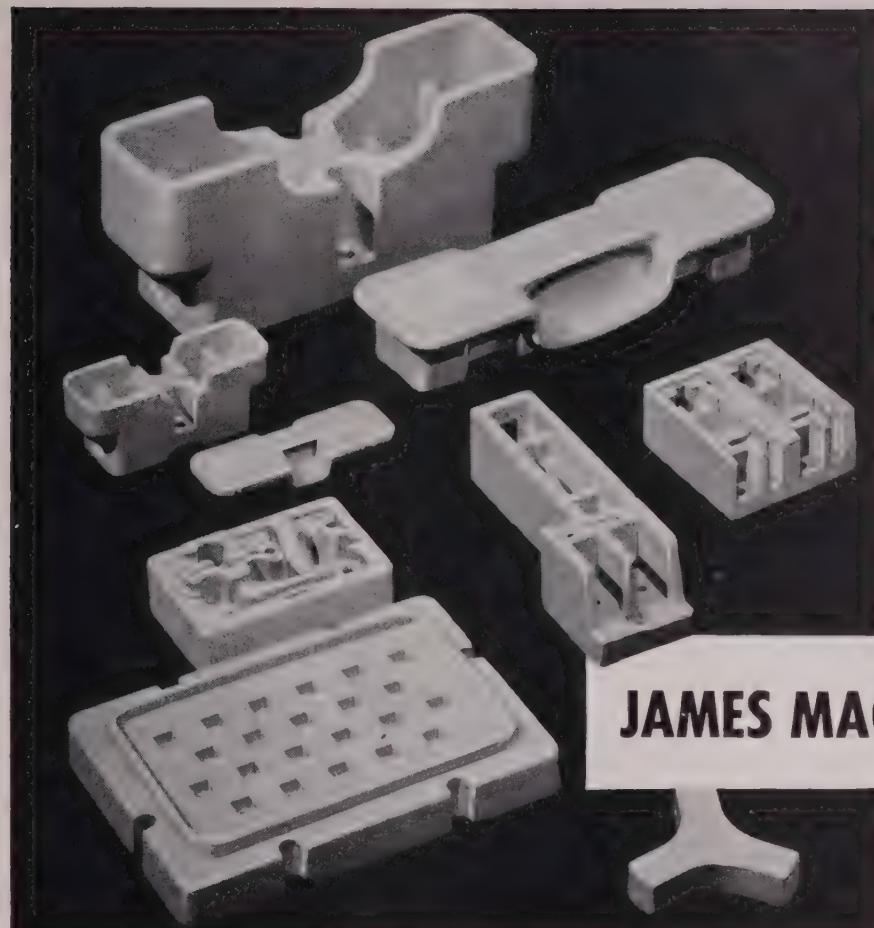


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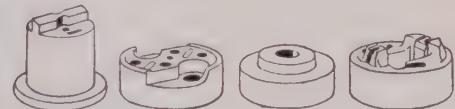
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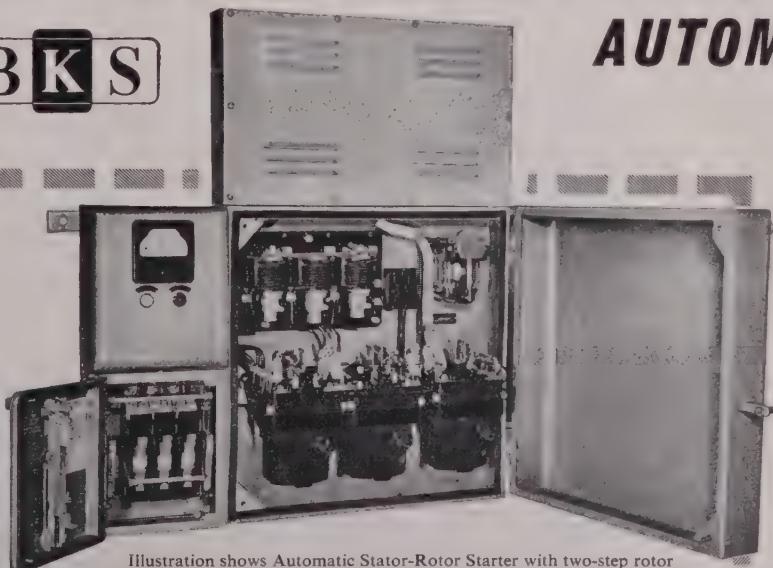


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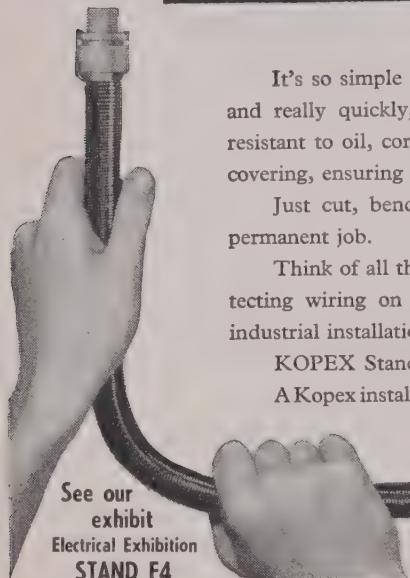
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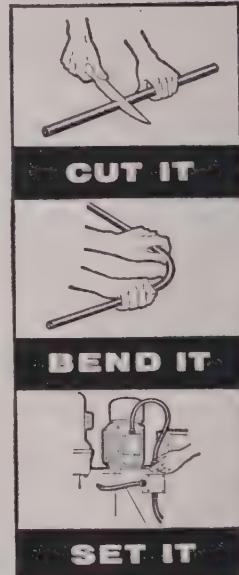
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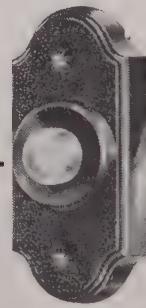
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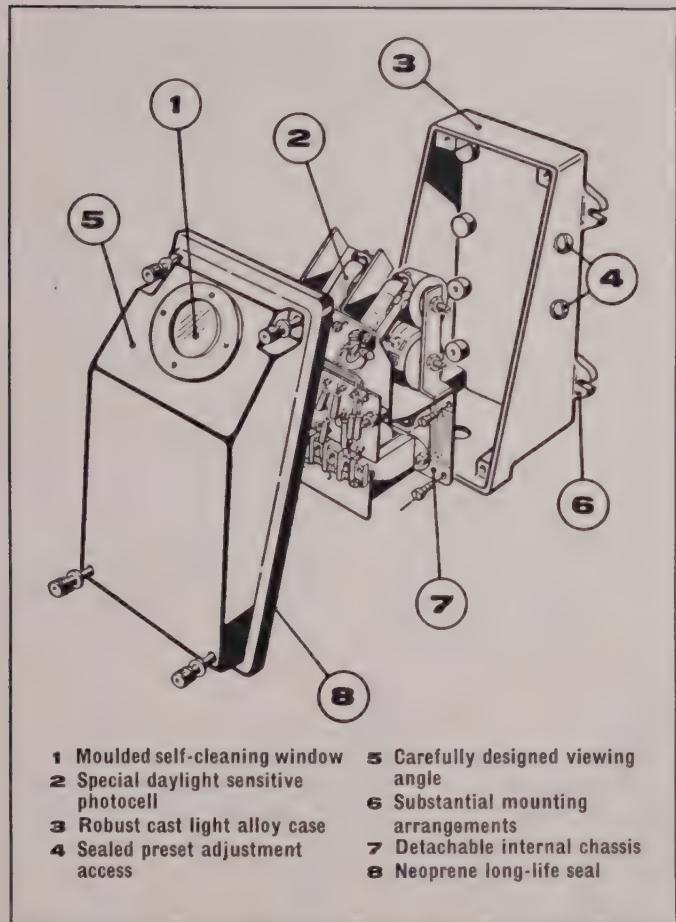
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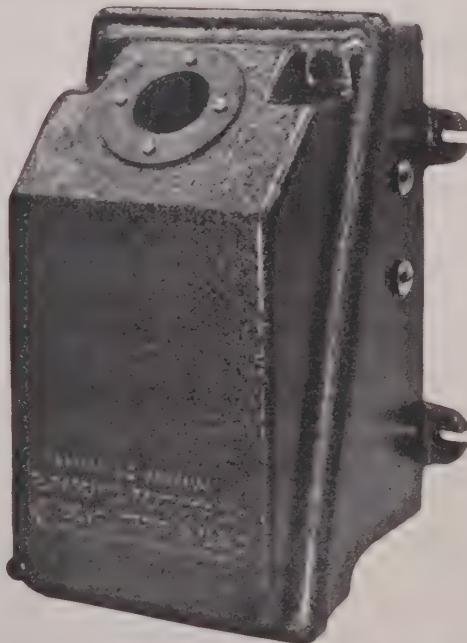
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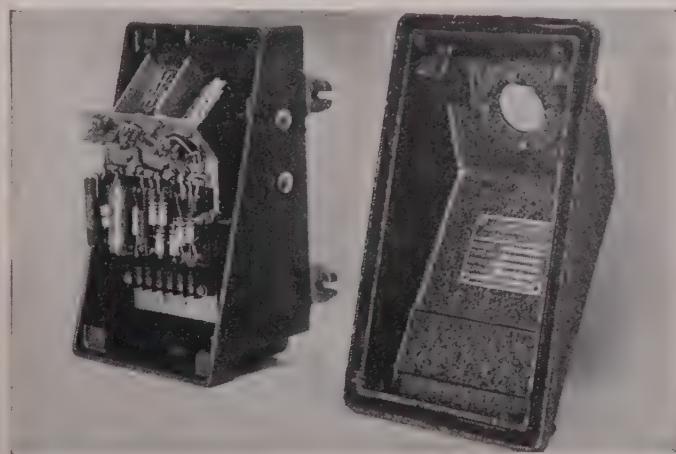
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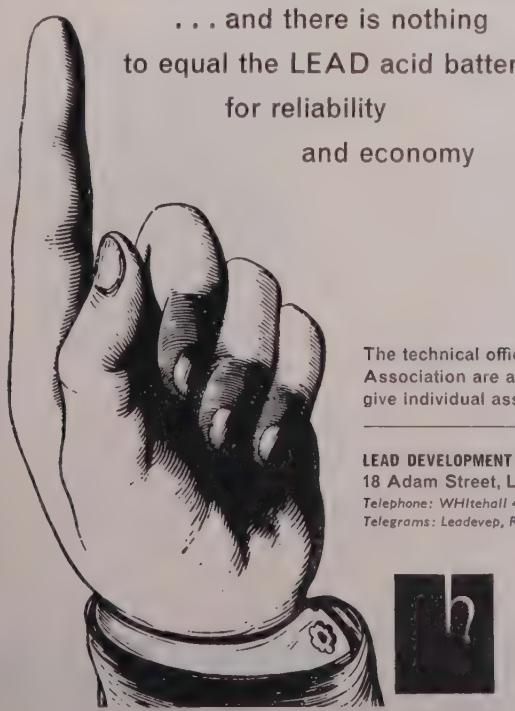
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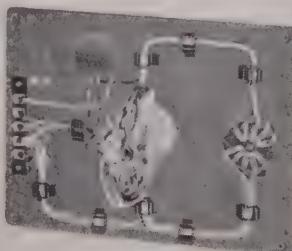


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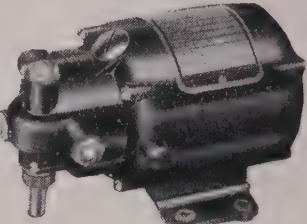
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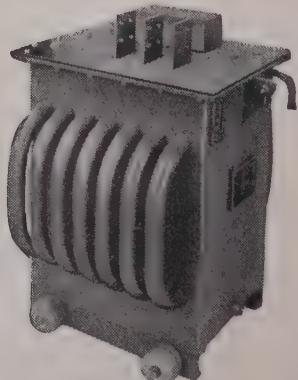
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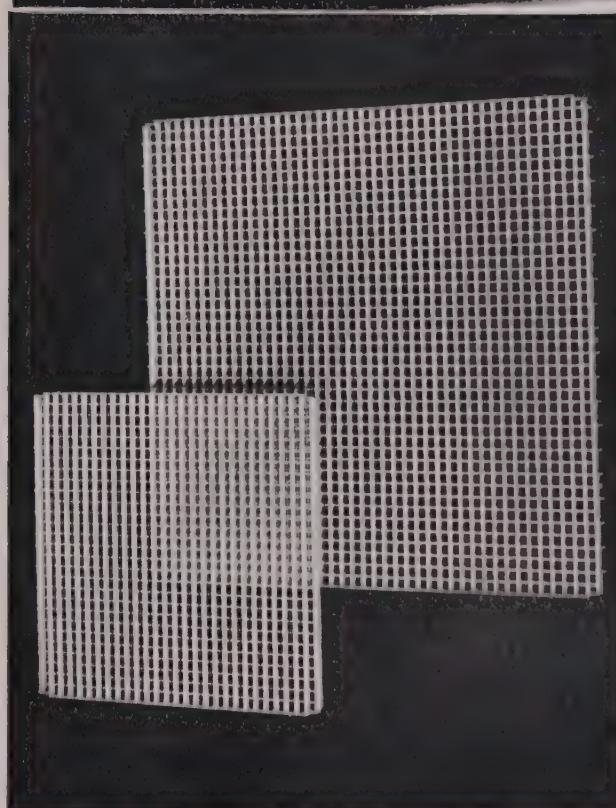
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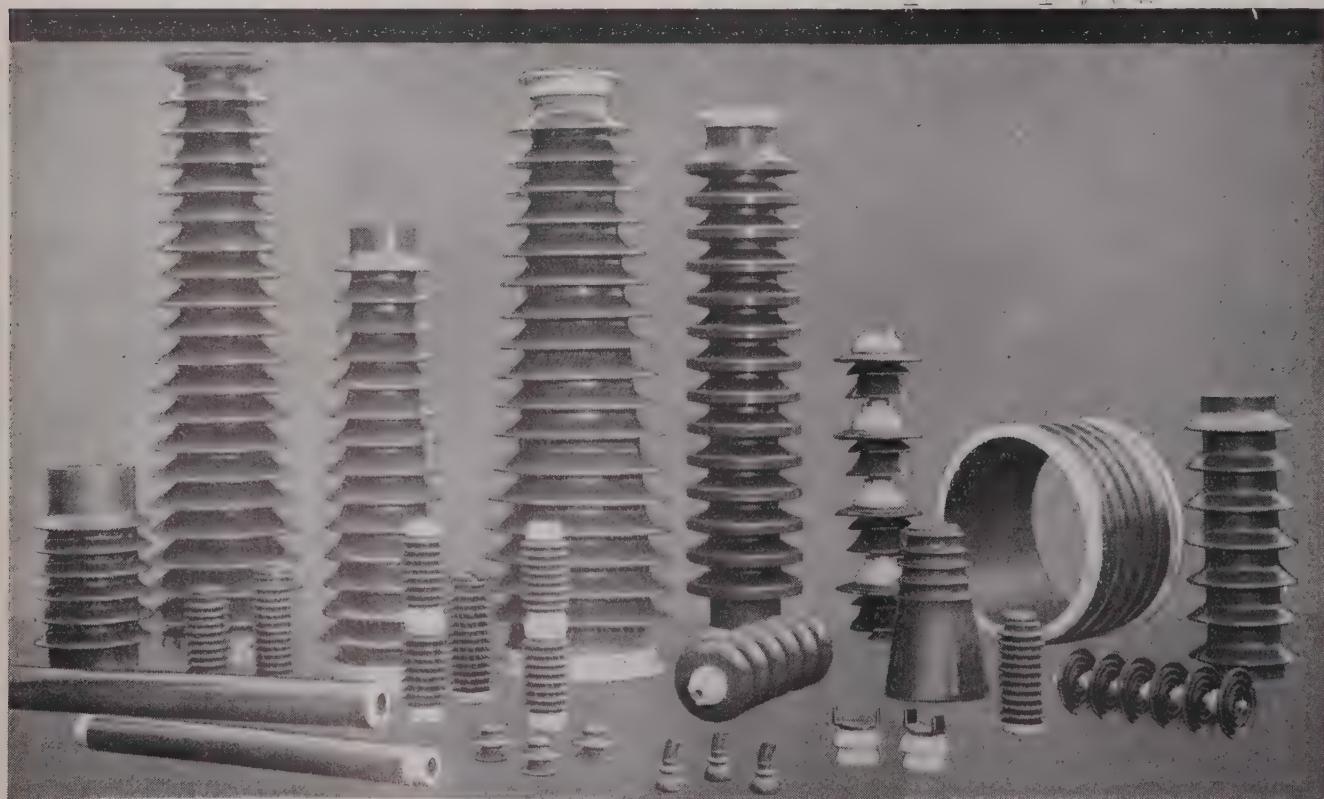
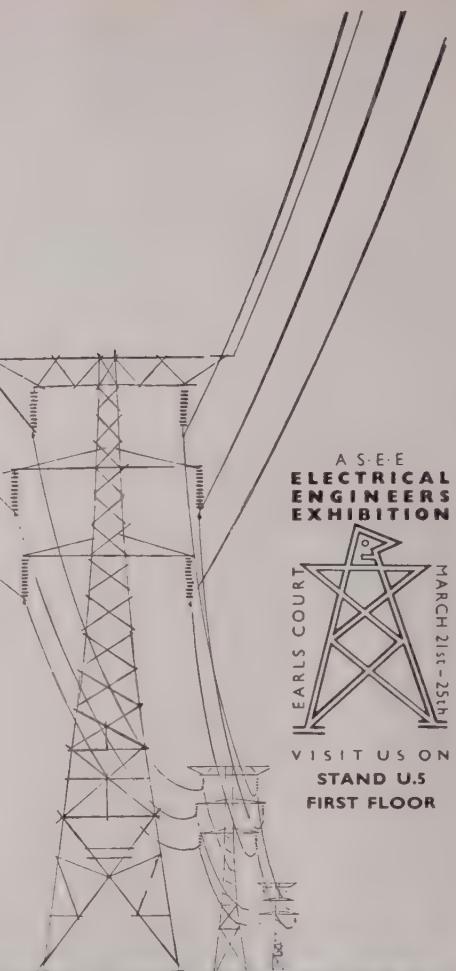
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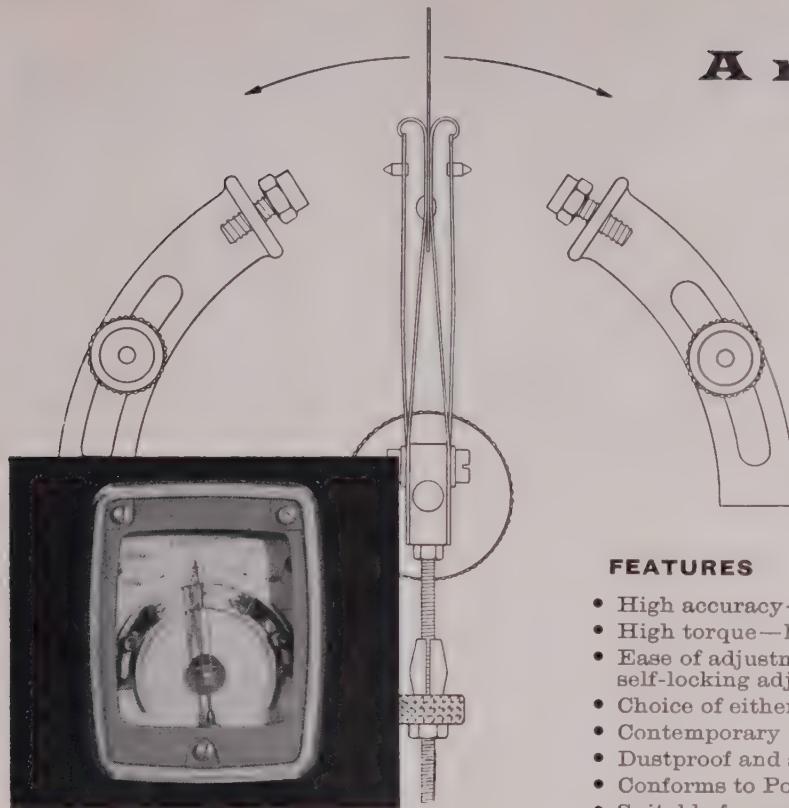
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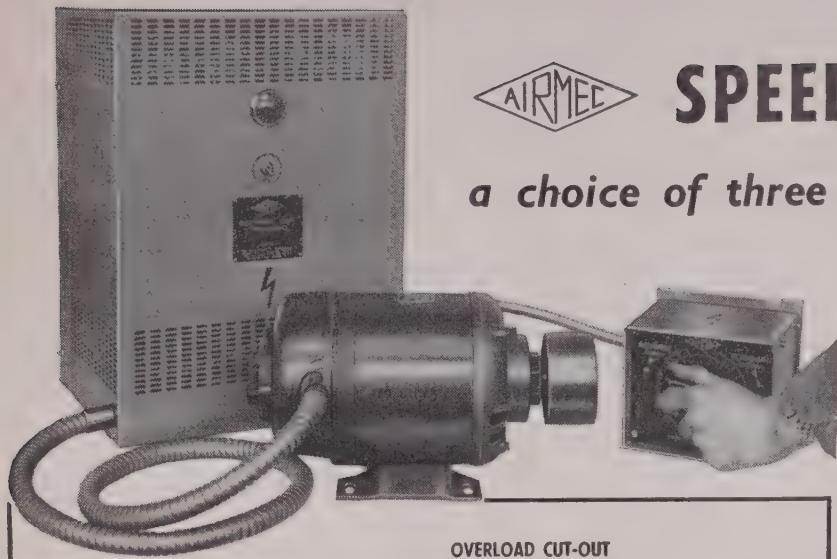
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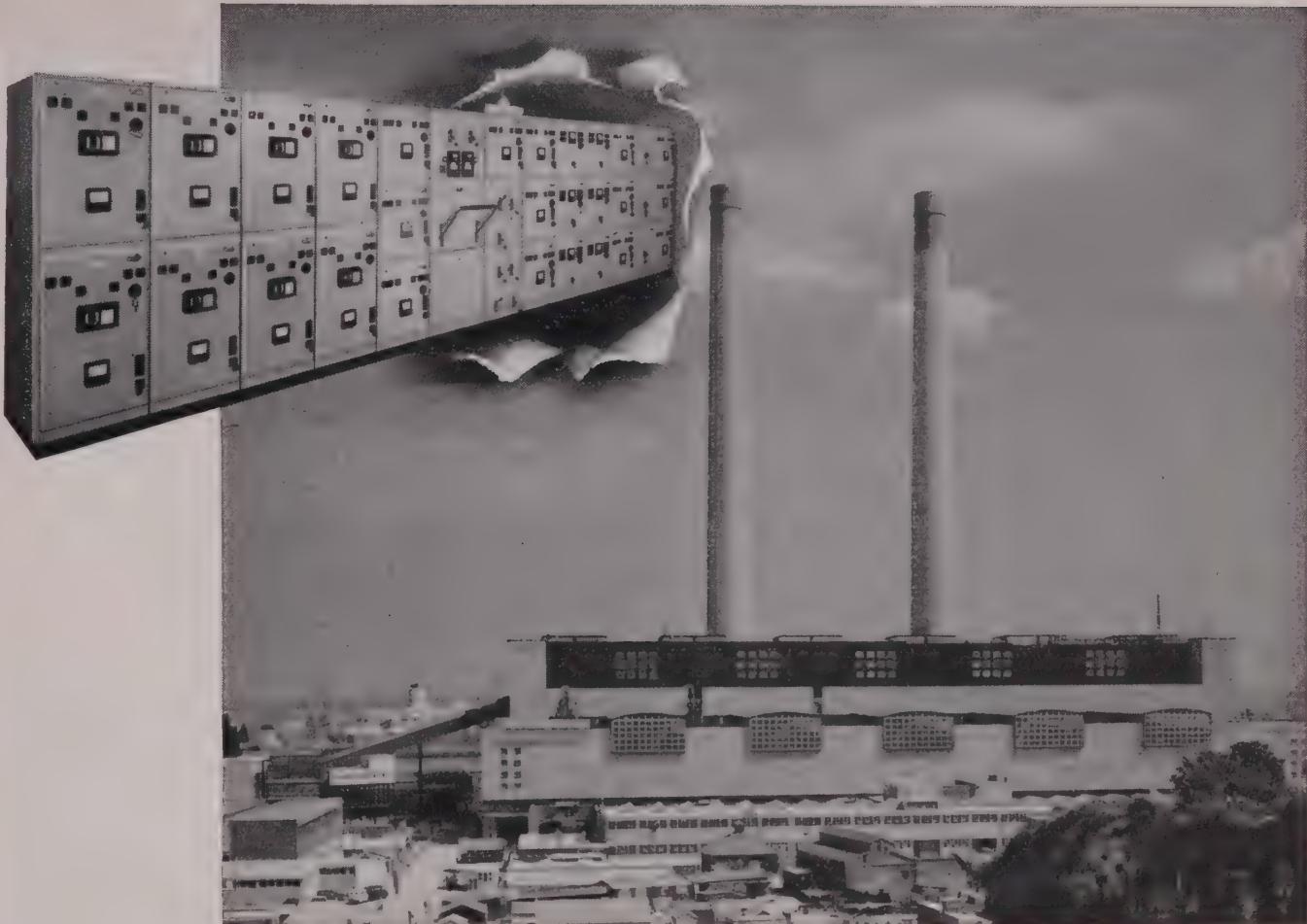
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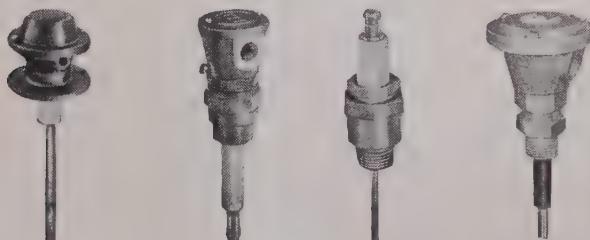
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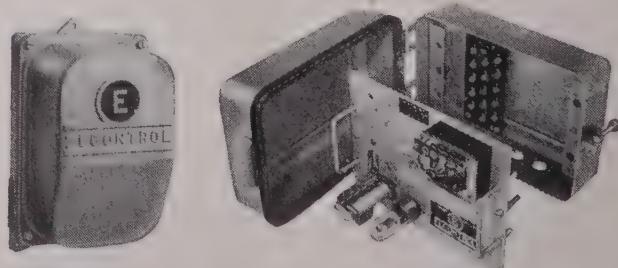
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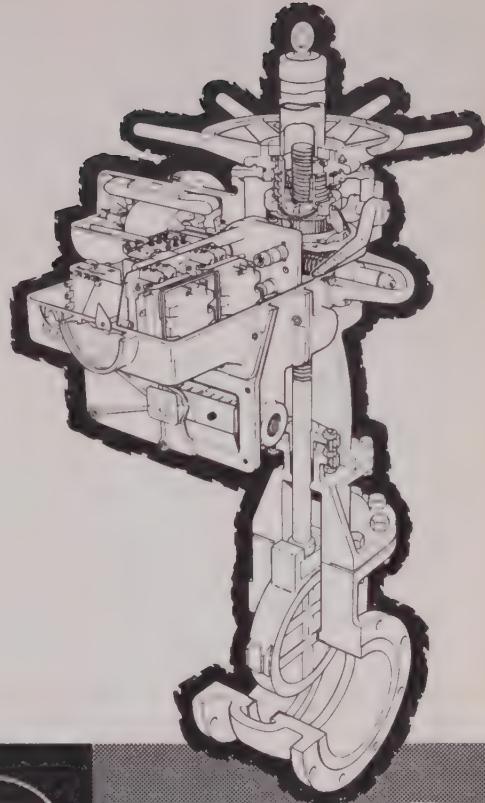
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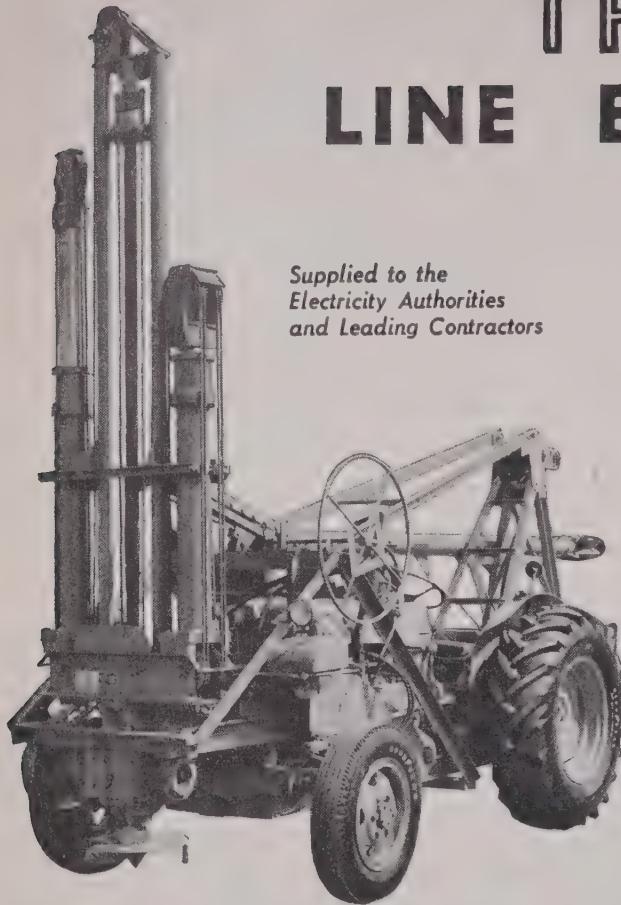
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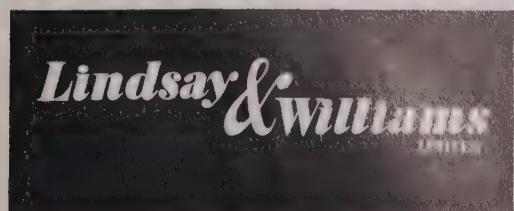
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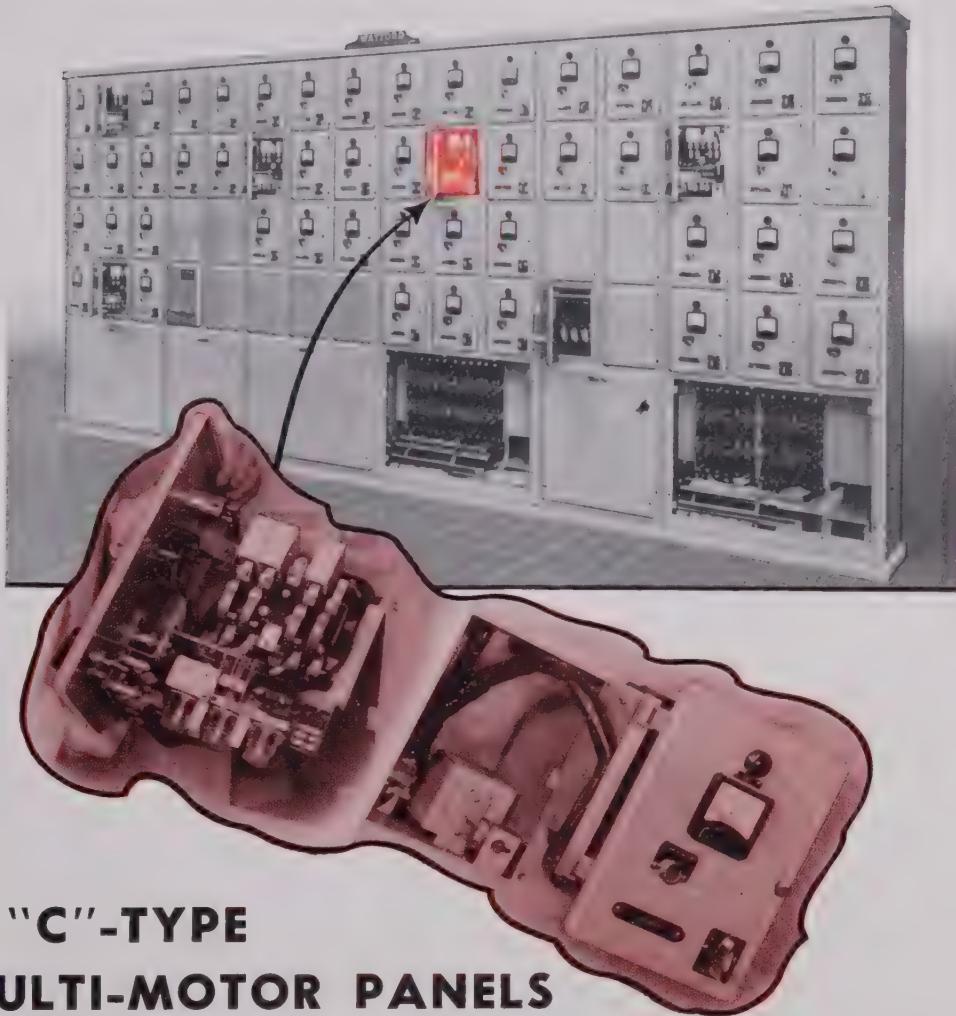
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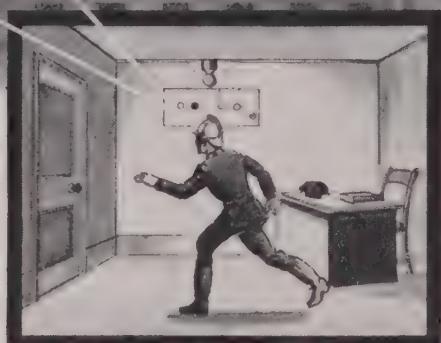
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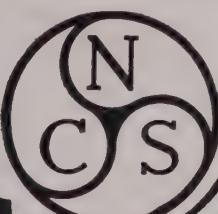
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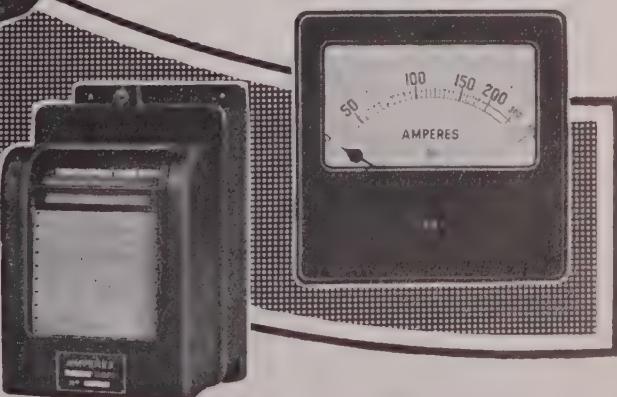
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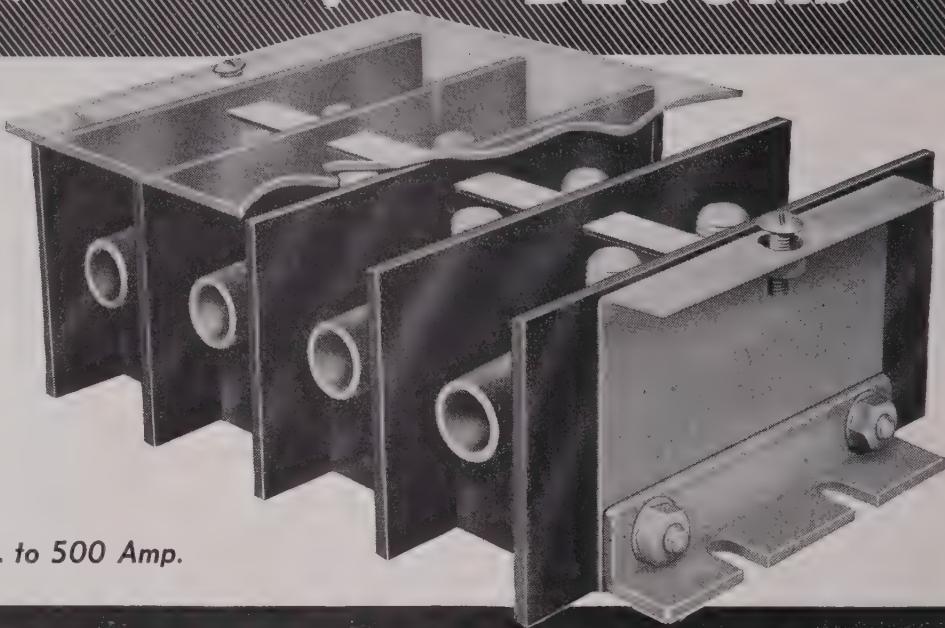
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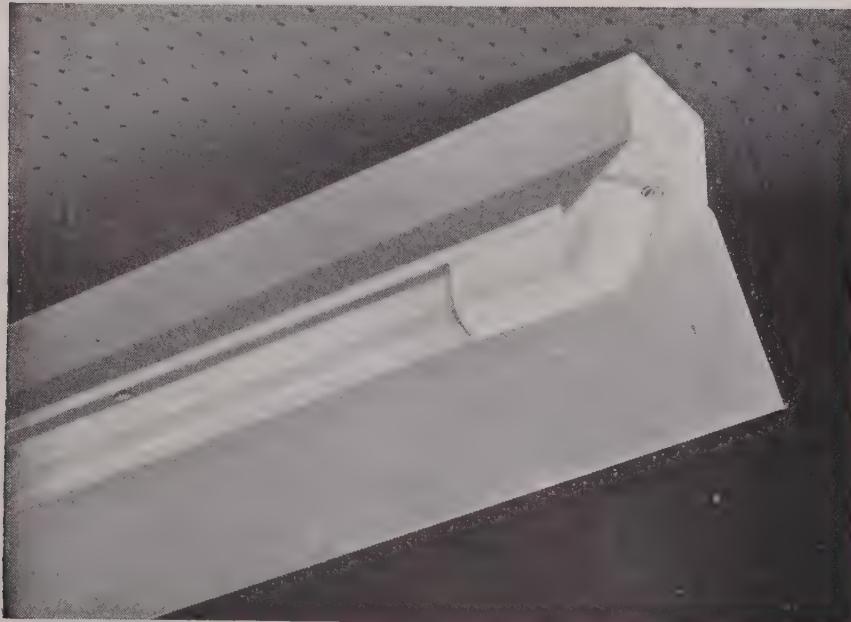
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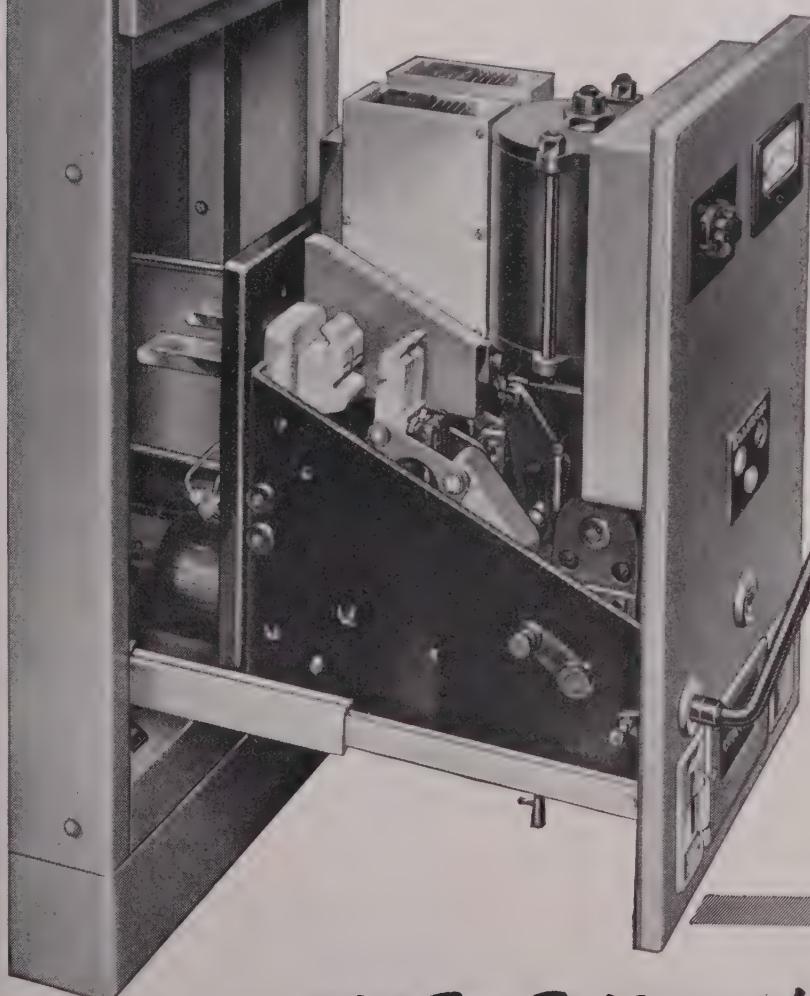
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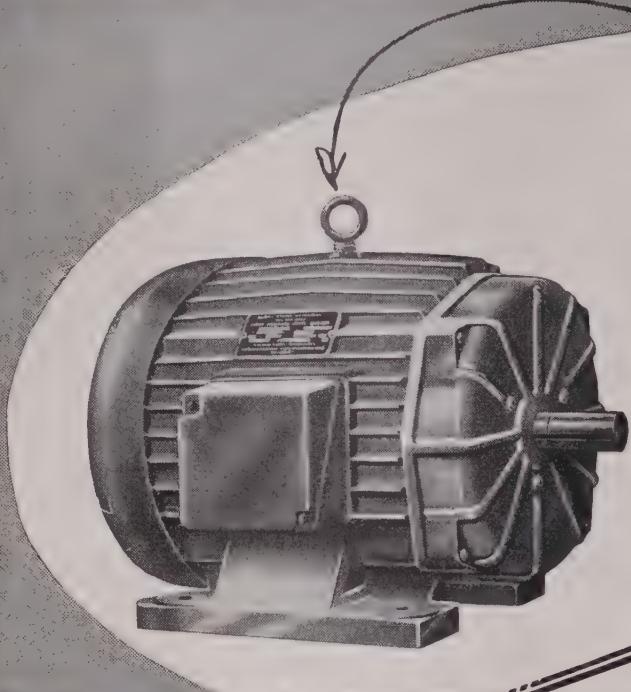
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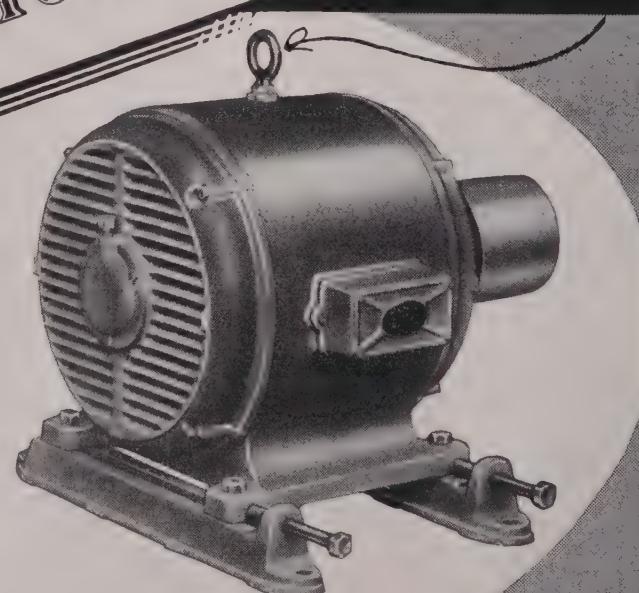
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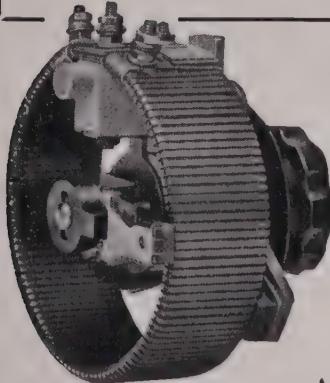


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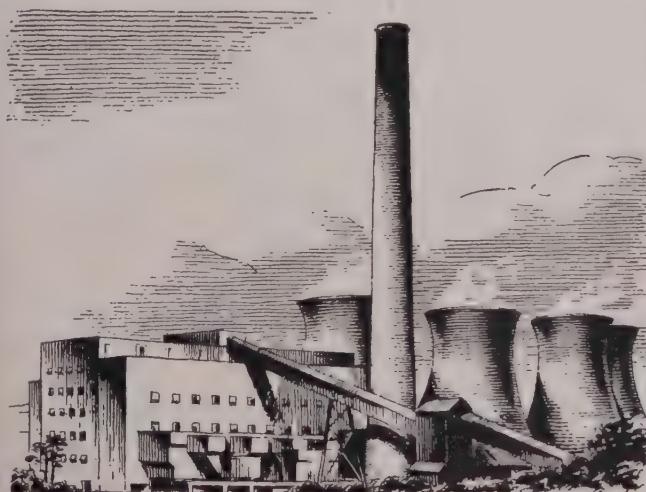
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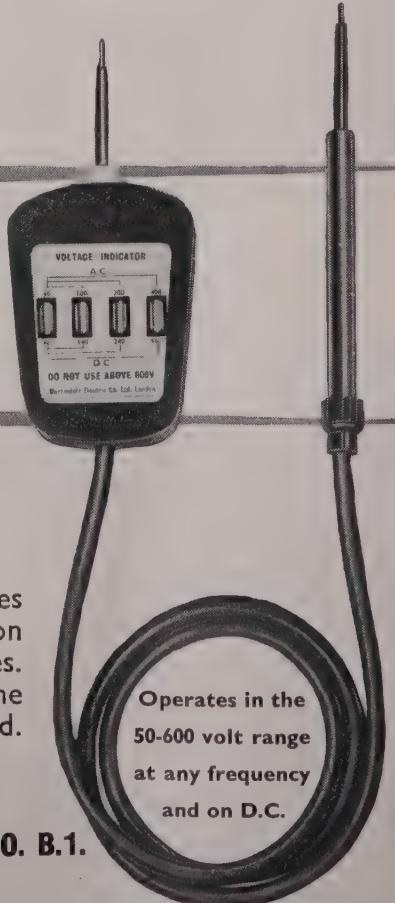
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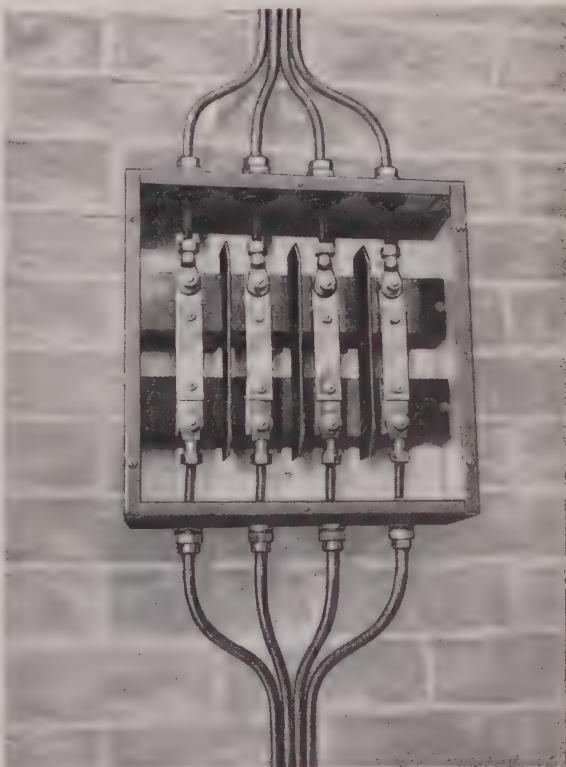
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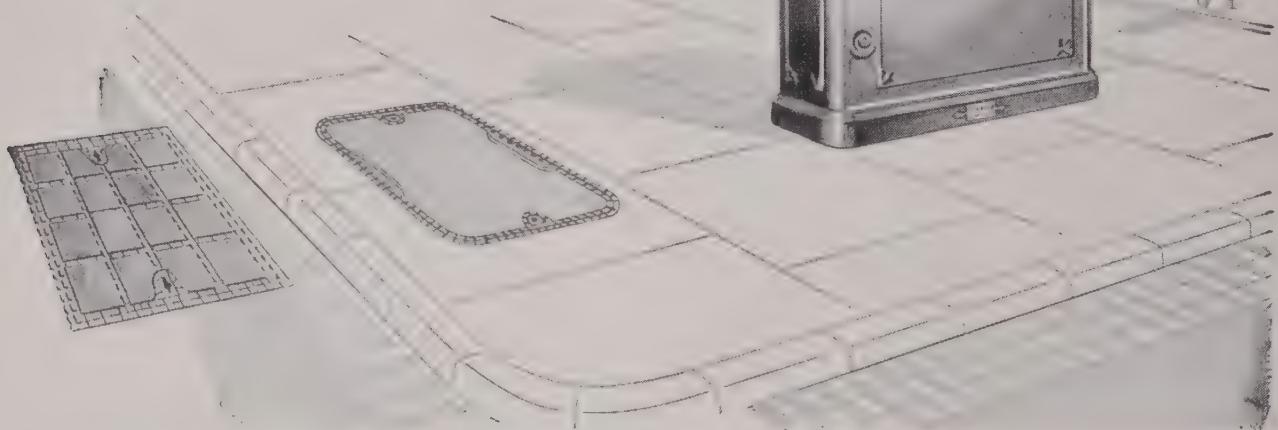
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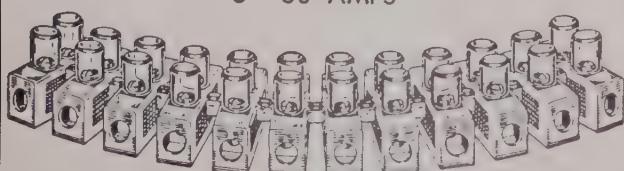


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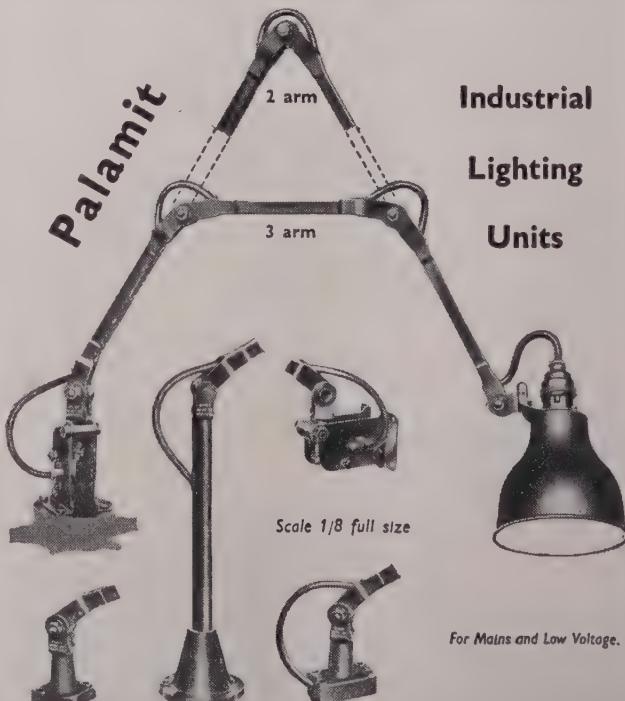


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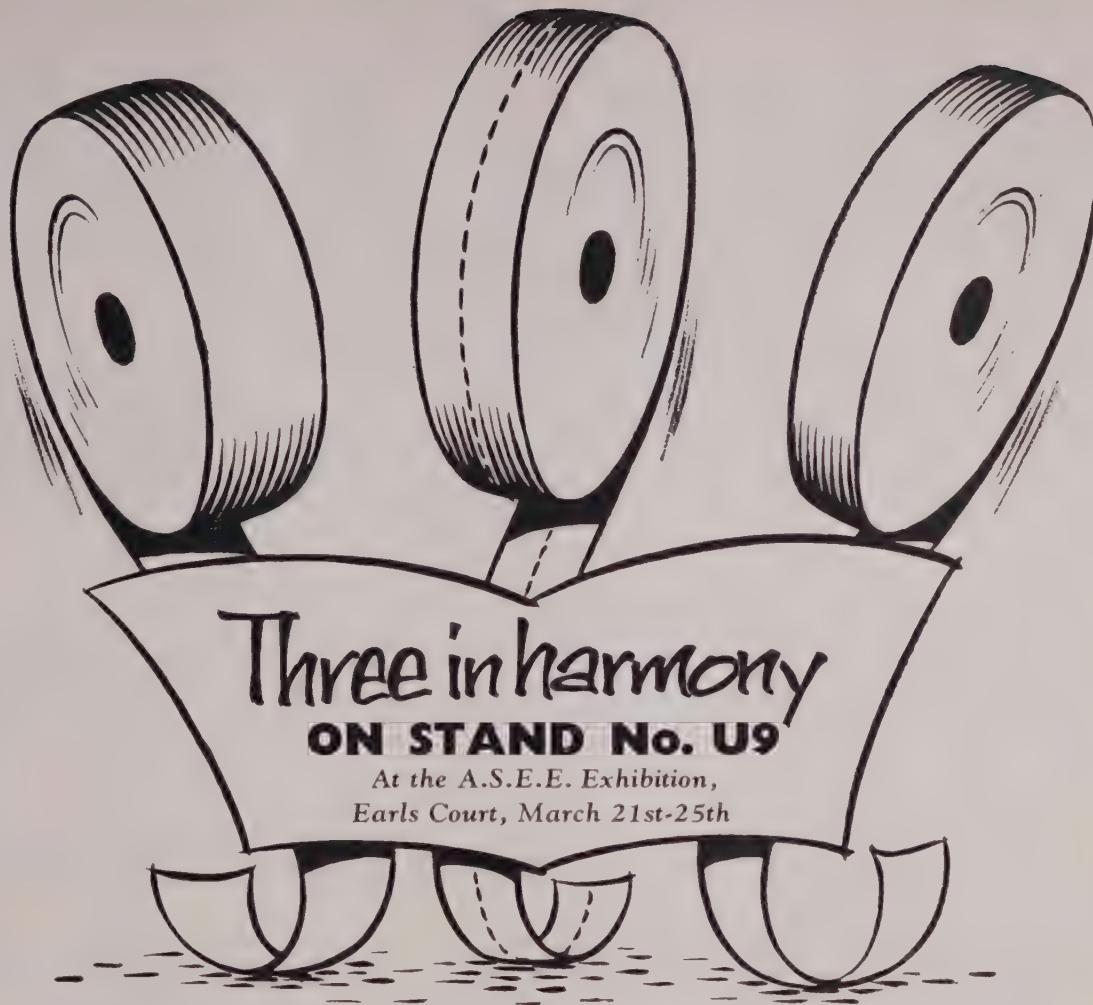
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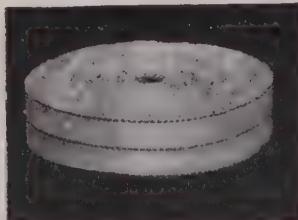
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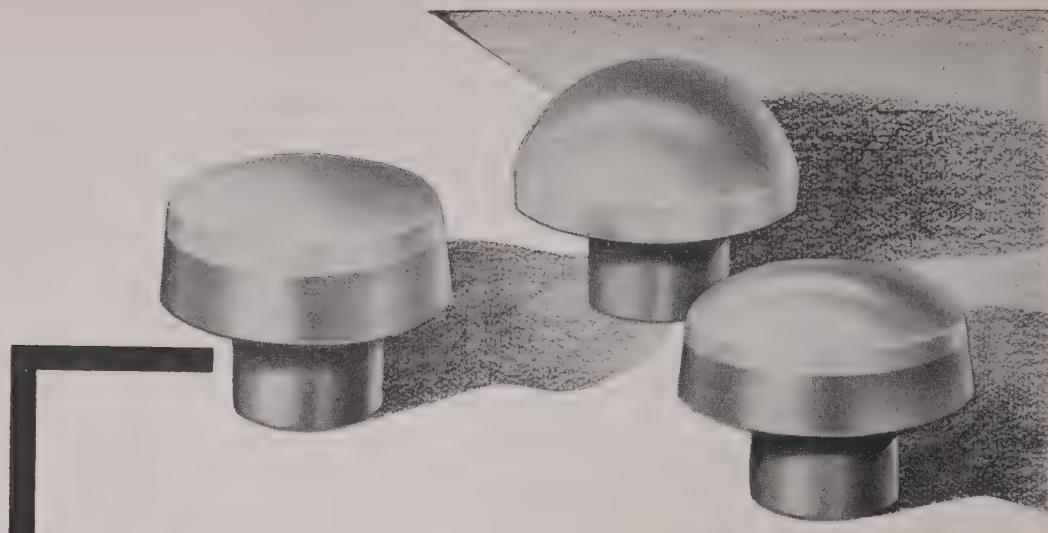
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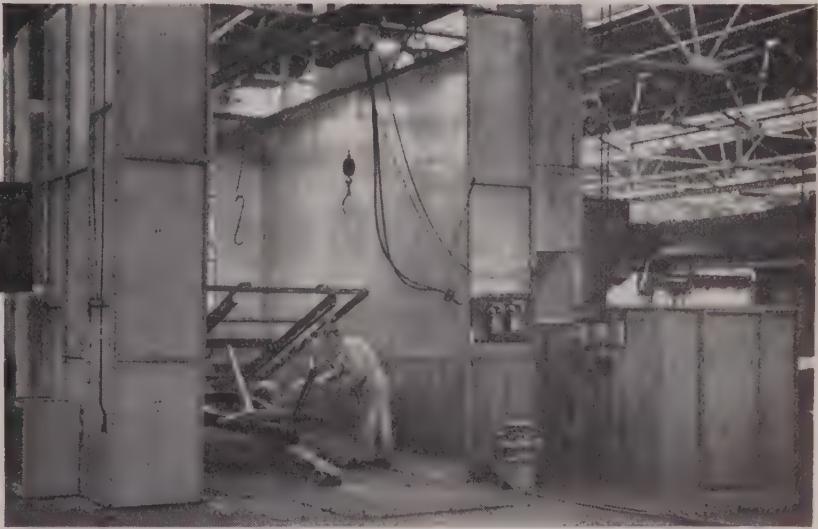
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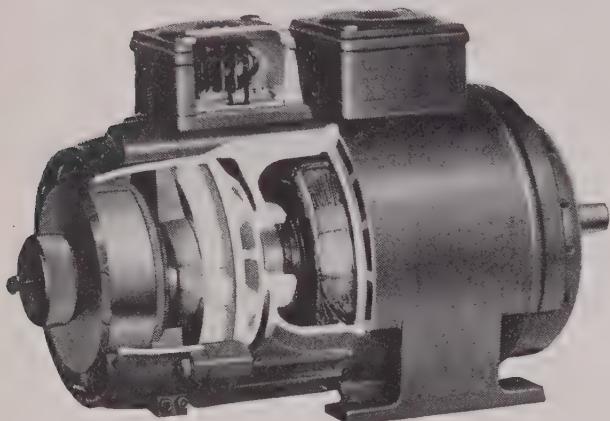
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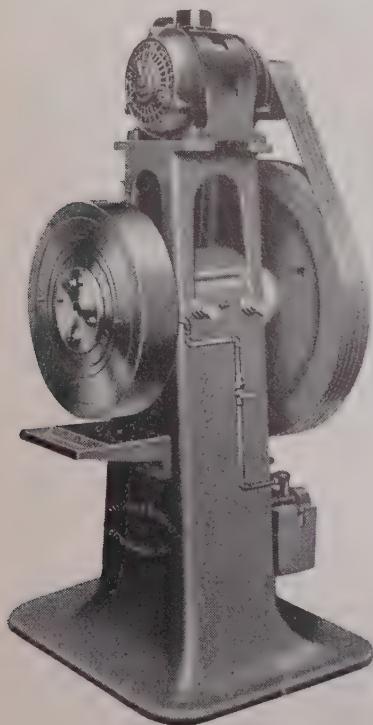
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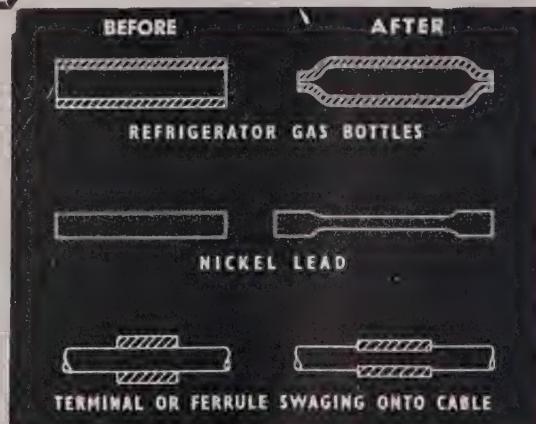
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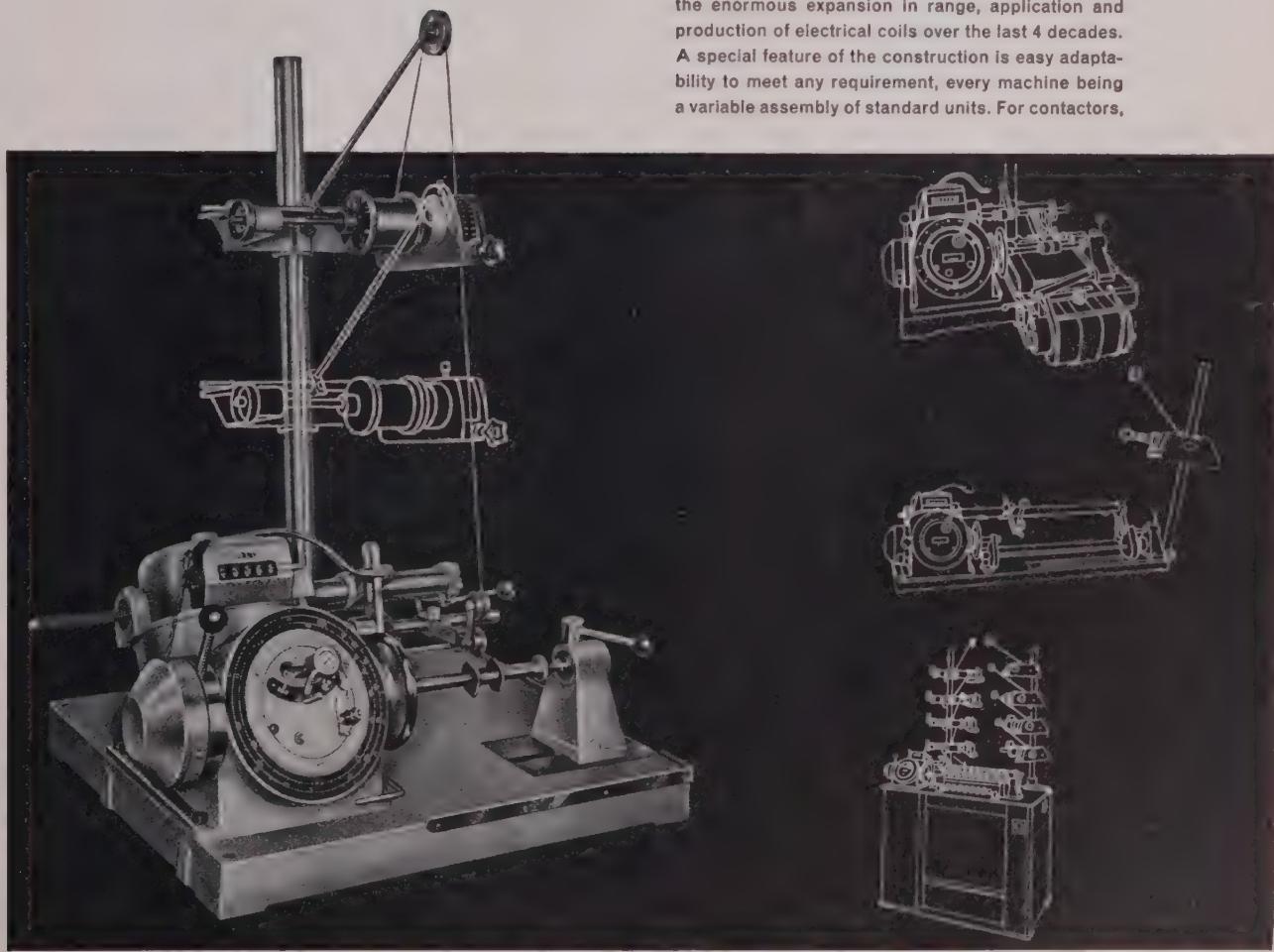
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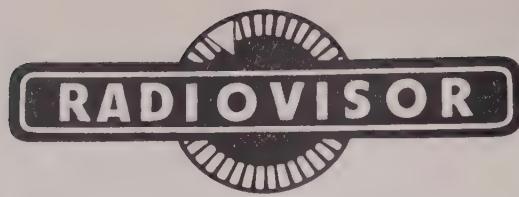


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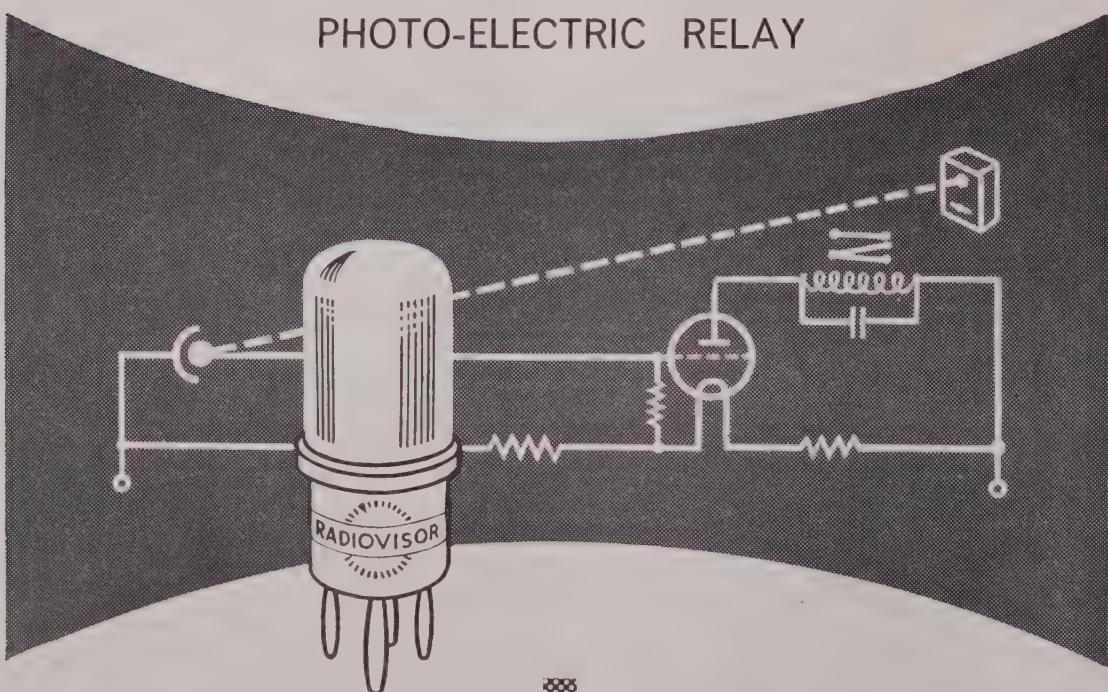


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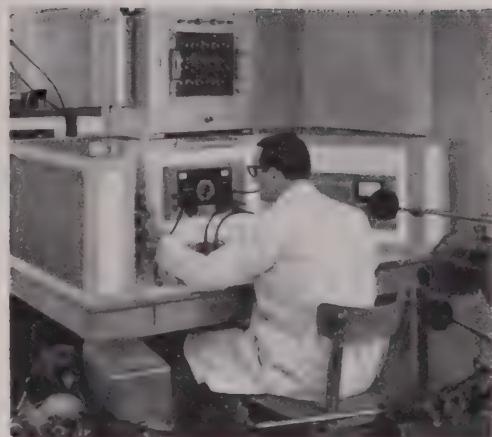
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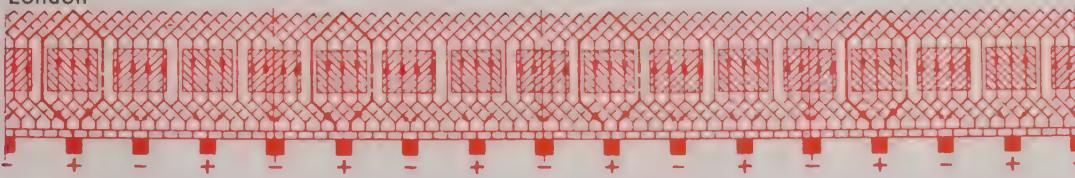
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Eighty-Ninth Year of Publication

# ELECTRICAL REVIEW

Friday 17 March 1961 Volume 168 No 11

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HUGH S. POCOCK, M.I.E.E.

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J. H. COSENS

Technical Editor:

A. R. POLLARD, A.M.I.E.E.

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Summary of the main features of the tenth Electrical Engineers Exhibition (Earls Court, 21st to 25th March) and a stand-by-stand preview. The opening ceremony will be performed by the Rt. Hon. F. J. Erroll, Minister of State, Board of Trade, at noon on Tuesday. A plan of the Exhibition and alphabetical list of exhibitors appears between pages 456 and 457

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# ELECTRICAL REVIEW

17 March 1961 Vol. 168 No. 11 Established 1872

## *Fifty Years of Co-operation*

THE benefits of co-operation between electrical manufacturers are no less real today than they were when the British Electrical and Allied Manufacturers' Association was founded in 1911. The necessity for some central body to co-ordinate the activities of an industry and to express the views of its members is now so generally recognised that it is difficult to realise the resistance to such a proposal that existed fifty years ago. The present strength of the electrical manufacturing industry in this country owes much to the influence that has been exerted by its leading trade association and the tradition of voluntary co-operation that it has fostered.

A trade association at its best should be more than a mere servant of its members. It should also initiate and guide. There are occasions when its Council and officers can see more clearly than individual manufacturers where the interests of the industry lie and how they can be furthered. The latest report shows how B.E.A.M.A., for example, has not only taken a lead in the collection of statistics but has impressed on member-firms the value of using these figures in conjunction with modern marketing techniques. With the abandonment of many price agreements there appears to be a greater willingness to broaden the basis of collaboration. Yet, as recent articles in these pages have shown, British electrical manufacturers have far to go before they can match the French and Germans in the provision of factual information for measuring the progress of different sections of their industry.

Energy and imagination are also being directed by B.E.A.M.A. towards the promotion of exports. In addition to the solid day-to-day work, a joint display of domestic appliances was recently organised at the Cologne Fair and a further, all-industry, export conference is planned for the autumn. Of special value are the regular meetings with Continental manufacturers.

But if B.E.A.M.A. is to continue to speak for the whole electrical industry, as it must on many occasions, it cannot ignore the effect of technical changes. Potentially the most significant item in the present report is the proposal to set up an industrial electronics section. Failure by B.E.A.M.A. in the past to cater specially for the needs of this most dynamic section of the industry and the consequent growth of separate trade associations—with a large duplication of membership—has emphasised the division between "electronic" and "electrical." The division is artificial and the proposed section could lead the way to a new unity in the electrical industry.

## SELLING ELECTRICAL LIVING

The difficulties which the domestic electrical appliance trade experienced last year have tended to lend support to the idea that if only the Government would refrain from interfering then the future development of this side of the industry would be assured. The truth is less simple. There are many conditions within the control of individual manufacturers and retailers that must also be observed. At the recent E.D.A. Sales Conference, Mr. S. F. Steward, in a paper that deserves to be widely read, put the main emphasis on "vigorous, enlightened and unremitting salesmanship."

Manufacturers could certainly make much greater use of modern marketing techniques and there is real scope for further co-operation in obtaining more complete statistics. These would not only aid manufacturers in their planning but would enable the industry's case to be presented to the Government with greater force. For their part the supply industry could adopt a less equivocal attitude towards the domestic load and particularly electric heating. The Electricity Boards are in close contact with the public and, in Mr. Steward's words, their showrooms should be "a focal point for electrical salesmanship and service."

There is also much that the two sides of the industry can achieve in partnership. Both have an over-riding interest in the promotion of electrical living, but observation shows that manufacturers, despite their enormously greater expenditure, give small, if any, attention in their advertisements to the general electrical theme that E.D.A. and the Boards are promoting. The need, as Mr. Steward says, is for better machinery to enable the industry's sales and promotional efforts to be directed towards a common aim.

## TRANSISTOR RELIABILITY

Reliability is obviously a deciding factor in the choice of a component for a complete equipment, for its failure will bring discredit not upon itself alone but also the whole apparatus. The more complex the equipment, the more important is this factor and it is not surprising, therefore, that much emphasis should be placed on this quality in the field of electronics. One component which has been singled out for much discussion on this aspect is the transistor, which, although now widely used, has been in production on an industrial scale for some five years only, compared with 30 years or more for the thermionic valve.

It was thought in some quarters, on its introduction, that the valve difficulties which it eliminated would merely be replaced by transistor troubles. It seems now, however, that the point has been reached at which it can firmly be said that semiconductor devices are no less reliable than any other electronic components, and this has been well illustrated by an exhibition recently held in London by Mullard, Ltd. Nevertheless, the users, and the manufacturers, are seeking even greater

reliability and whilst it will undoubtedly be achieved, it will require considerable expensive effort by the manufacturers. Not unnaturally, the customer requires certification of the claimed reliability, and yet this is both time and space consuming. To determine a failure rate of one component in 1,000 during 1,000 hours' operation, it is obvious that 1,000 devices must be run for 1,000 hours. As failure rates diminish this problem must increase, but the manufacturer must be consoled by the fact that even if the results merely support what he already believes, it is the only tangible evidence likely to impress the customer.

## SCOTTISH POWER INQUIRY

Hydro-electric plant represents 81 per cent of the total installed capacity in the North of Scotland Hydro-Electric Board's area while 93 per cent of the South of Scotland Electricity Board's plant is coal-fired. The total installed capacity is 1,052 MW in the North and 1,884 MW in the South. At the end of last year, the capital assets of the Hydro Board were £216 million and the corresponding figure for the South of Scotland Board was £239 million. For water power stations in the North of Scotland the cost of electricity per kWh sent out was 0.787d and for the coal-fired stations in the South 0.857d.

The present state of the Hydro Board's affairs thus seems to be satisfactory, especially when it is considered that 364 MW has been exported to the South of Scotland at the time of maximum demand there. However, the Government has decided to set up a committee to inquire into the Scottish electricity supply industry. The report is expected to be published towards the end of the year and in the meantime no new hydro-electric schemes will be allowed to proceed.

With modern techniques and the use of coal-fired plant of the order of 500 MW, it is possible to reduce the cost of base-load electricity, including allowance for capital costs, below that of hydro-electric plant. But the most economical peak-load plant is hydro-electric; hence the construction of the Ffestiniog pumped storage scheme. Even with the pumping losses, this scheme is economically attractive and until peak-load nuclear plant is available the case for hydro-electric installations is a good one.

## NEXT WEEK'S ISSUE

will contain a report of the official opening by Mr. F. J. Erroll, Minister of State, Board of Trade, of the tenth Electrical Engineers Exhibition at Earls Court and a survey of some of the noteworthy exhibits among the wide variety of goods displayed, complementary to the stand-by-stand preview on pages 456-491 of this issue. There will also be a further supplement in our domestic electrical equipment series, the subject on this occasion being vacuum cleaners and floor polishers

The increasing use of automatic processes in factories focuses attention on the design and installation of sequenced contactor operation. These notes, based on many years of experience, are written mainly from the purchasers' viewpoint and deal with main cabling, control circuits, isolators, interlocks and timing devices associated with normal conditions. Processes demanding flameproof or other special gear are not covered



Cubicles controlling a steelworks cooling water supply. The cables are in ducts

## INDUSTRIAL CONTACTOR GEAR

By F. BRASSINGTON, A.M.I.E.E.

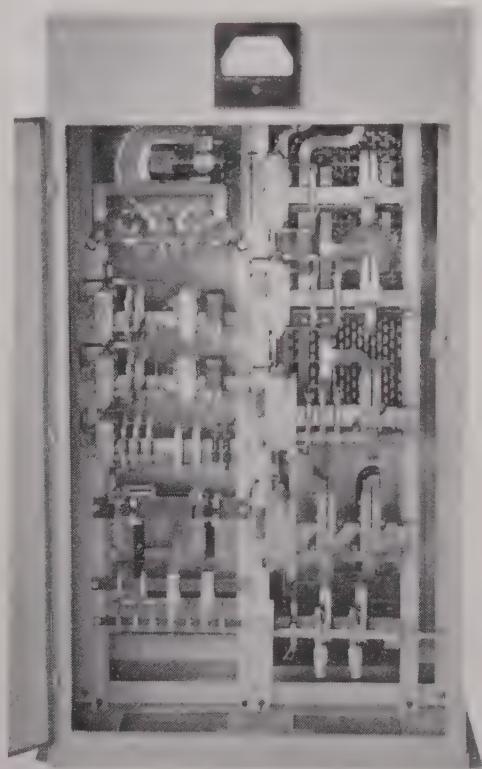
ELECTRONICS and magnetic amplifiers play a part in many automatic control schemes, but contactor gear has the final and major role in the control of the vast majority of machines and devices. Thus, careful consideration should be given, not only to types, makes and capacities of contactors, but also to siting. The works

electrical engineer should make a careful study of site conditions before ordering any gear whether for new plant or for modifications to existing machines. The latter call for special treatment as the action of increasing the output of a piece of plant may subject the mechanical gear such as shafts and gearing, and even the motors, to load conditions for which they were never designed.

### The Space Factor

Additional factory area may also be required to accommodate the control cubicles, motor-generators, etc., unless special arrangements are made in the cubicle design stage to reduce the floor area required. This can often be achieved by building the panel or panels upwards in tiers with access in the form of a metal grid platform fitted with an adequate guard rail. Alternatively, extra panels and even motor-generator sets can be housed in a pit if ground conditions permit. In this case, adequate ventilation must be provided and this will, of course, increase the cost of installation. A disadvantage of this arrangement is that the control cubicles cannot be seen from the machines that they control. This is a big handicap to maintenance staff when fault-finding, as they cannot see what effect their operations on the contactor panel are having on the machine or machines. In these circumstances they have to rely on observation by a second party, which slows down the job. Moreover, there is a great danger of accidents occurring due to possible confusion arising over signals.

Certain instruments should be installed on the contactor cubicles for monitoring purposes but, as far as possible, the majority of instruments should be installed near to the point of machine control. Main ammeters, voltmeters and speedometers should be able to be read quickly and accurately by the machine operator or operators. But such instruments as power factor indicators,



Typical bar-mounted contactor gear

kWh meters, line voltmeters and field ammeters, together with trimming rheostats, change-over switches and infrequently operated pre-selector switches are much better sited on the main contactor cubicles.

Pilot lights are necessary on both control stations and main cubicle, the important ones being duplicated, e.g. the "Power Supply Available" lamp being shown on both types of panels. A standard colour code should be laid down and adhered to strictly. Illuminated mimic diagrams of a complete process are useful but, in general, these should be sited on the main contactor cubicle as usually they are of interest only to the technical staff. The supply of an adequate number of pilot lights is admittedly essential to the efficient operation and servicing of the plant, but too many can cause perplexity and confusion.

Where control gear is to be installed in new special-purpose buildings, ideal siting can usually be achieved, provided that the management can be convinced that adequate space allotted to the "electrics" can result in reduced running costs in the form of easier and quicker maintenance, better ventilation and increased operational safety.

### Ventilation

There should be adequate clearance between the backs of the contactor cubicles and the nearest item of plant or factory wall, for access and ventilation. A distance of 3ft also allows a clear walkway. Ventilation is doubly important if the control gear is housed in a separate room where motor-generators, exciter sets and the like are installed. Under such conditions it is possible for the ambient temperature to reach 100 to 120°F if there is inefficient disposal of machine heat. It is also not good practice to mount main line resistances inside contactor cubicles. They should form a separate cubicle or be fixed on the top of the cubicle with which they are associated.

### Connections

Cabling routes between machines and cubicles can be either underground or overhead depending upon the floor facilities and headroom. If the manufacturing process does not involve the possibility of liquids lying on the floor, underground ducts or conduit cast in concrete can be used. These can be installed when the concrete floor is laid, care being taken that the cable runs do not foul ventilation ducts or other services. Underground cables require terminal facilities to be supplied at the bottom of all cubicles arranged over small trenches deep enough to allow the entering cables to be readily bent into a vertical position for easy connection. If p.i.l.c. cables are used, they should be of the drained or pre-impregnated type.

Provided there is sufficient headroom and there are no gantry cranes, overhead connections can be employed. In a building with a high roof, it may be necessary to install some form of overhead bridge or trunking to carry the cables between machine and cubicle. This arrangement is unsightly, but it very often has the merit of being cheaper and quicker to install especially if the floor existed before the plant was installed.

With cambric- or paper-insulated lead-covered cable for a medium-voltage system, it is a moot point whether

to allow for steel wire armouring. If the cable is laid in ducts, armouring is usually unnecessary, but if the cable is laid directly in the ground with no ducts, then armouring and serving are essential for protection and preservation. To reduce fire hazards, cables laid in ducts should never be served or, at least, the serving should be removed for 2 or 3 yards from the terminations.

P.v.c. and v.r.i. cables can be run in conduit or trunking or arranged in multi-core form which should be lead or p.v.c. covered. A few spare cores should be included to allow for possible future core faults. Mineral-insulated cables are more expensive as the cores available cannot usually exceed seven but, properly designed and installed, this type of cable makes a very neat layout. Such cables, however, should not be used on highly inductive main or control circuits operating on d.c. unless special precautions are taken to cater for the safe discharge of transients, since this type of cable has a low dielectric strength. The insulation of a small twin-core m.i.c.c. cable feeding a simple stop and start pushbutton unit has been known to break down on a 110 V d.c. control circuit, when the frequency of operation reached 50 per hour. The use of a surge suppressor connected across the coil would have obviated this trouble.

### Contactor Supports

Contactor gear can be mounted on synthetic resin panels or fixed on steel bars attached to the inside of the cubicle. The former panel has a much better appearance, but lacks flexibility of component movement and appears to have a slightly greater tendency to "track" between opposite poles. With the supporting bar type, nearly all the wiring is visible and can be inspected from the front of the cubicle, but it may cost a little more. A bar-mounted contactor panel can also be mounted on a wall, thus saving considerable space.

### Isolators

It should not be possible to open any cubicle door with the main isolator in the closed position. With a panel, say, 15ft or more in length, a common locking bar passing through all cubicles may be difficult to install and operate, but the introduction of figure locks can simplify such an arrangement. Change-over or reversing isolators can be dangerous if insufficient thought is given to the necessary interlocking details. Isolators are often designed to open under no-load conditions but, in the author's opinion, any isolator should be capable of breaking the full-load current of the equipment in an emergency without damage to itself or the operator. The siting of the isolator is important; it should not be necessary for one to take up an awkward position such as kneeling or lying flat on one's stomach to operate it.

Back-up protection for contactor gear (which has a low fault current breaking capacity) can be provided by h.b.c. fuses. Such devices can be used with safety in medium-sized contactor panels, but where protection for large units is required and to prevent single phasing, the writer has invariably used a circuit-breaker installed near the contactor equipment.

### Contacts

Contacts are usually of copper or an alloy and are of the line contact type which gives a wiping action although

some manufacturers are using the butt type where heavier contact pressure is employed. However, when frequency of contactor operation reaches 100 an hour, such as with lifts and cranes, where a great deal of inching occurs, the author prefers copper-to-carbon contacts which, in his opinion, reduces the possibility of "welding-in" to the minimum. It is axiomatic that such contacts should never be cleaned with emery cloth or files, particularly copper-to-copper line contacts. When servicing is required because of wear, the contact tips should be completely renewed.

### Control Supply

There are various methods of providing a control circuit supply some of which are not 100 per cent reliable and safe. Cost should not be allowed to dictate the issue. A low-voltage control supply is not only a step towards safety but it enables more robust coils to be employed on contactors and it eliminates the possible dangerous consequences of fortuitous earth faults on the control wiring. These present a grave hazard as they may cause involuntary contactor operation when push-buttons, initiating switches, etc., are standing in the "off" position.

A control circuit of a small contactor and motor with the control supply taken from phases A and B of the 415 V three-phase supply is shown in Fig. 1. With no control circuit fuses, an earth fault developing at X or Y will eventually cause phase B main fuse to blow. If the phase-to-earth voltage is sufficient to hold the contactor coil in the closed position, the motor will single-phase with the fault existing in either position. Though, under fault X conditions, the motor can be stopped by either the stop button or the overload trip, under fault Y conditions it will be impossible to stop the motor without opening the panel isolator (not shown).

By introducing a small control transformer (Fig. 2) this hazard can be avoided as it will be seen that an earth fault occurring at X will merely blow the secondary circuit fuse and the coil will become de-energised. An earth fault at Y position cannot interfere with the normal functioning of the circuit as no voltage difference will exist between Y and E. Some engineers prefer to earth a mid-way tap on the transformer secondary winding instead of earthing one pole. This arrangement is just

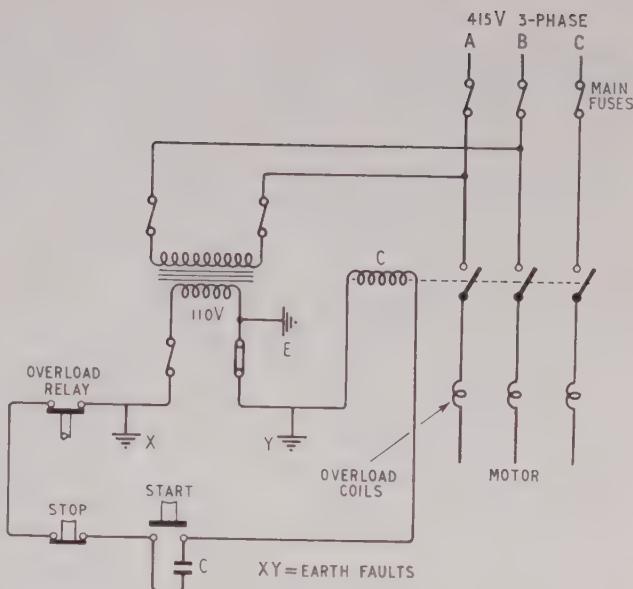


Fig. 2.—A reliable motor contactor control circuit

as dangerous as the conditions shown in Fig. 1 as a fault occurring at X might cause the contactor coil to hold-in at half voltage. The author does not recommend adopting a lower control voltage than 100. Experience has shown that high-resistance contacts occurring on push-buttons and the like can cause intermittent trouble when low voltages such as 50 or 25 are used, unless steps are taken to fit silver contacts to all components which, of course, increases the initial cost.

Arrangements are often made to use d.c. as a control supply using a control transformer-rectifier at a reduced secondary voltage of 100 to 200. Such a supply has the following advantages over a.c.:—(1) Quiet operation; (2) no risk of coil burn-out due to a partial closure; (3) less tendency to "bounce" and "weld-in"; and (4) no inrush current and therefore a smaller control transformer for the rectifier is needed. The disadvantages seem to be:—(1) The extra space and attention needed by a rectifier; (2) higher voltage regulation of the rectifier; (3) more expensive coils plus cost of rectifier; and (4) the need for the use of economy resistances to provide coil "forcing." With regard to the last point, if these are not carefully designed and tested before being approved for use, they can become a source of trouble. If the value of the economy resistance is too low, the coil heats up and eventually, if it does not burn out, it becomes so hot that its increased hot resistance will not allow it to "pull in" and it may drop out on the slightest provocation. On the other hand, the economy resistance value may be too high, when the coil, though keeping within its maximum temperature, becomes ultra-sensitive in the closed position and will fall out with a slight drop in voltage.

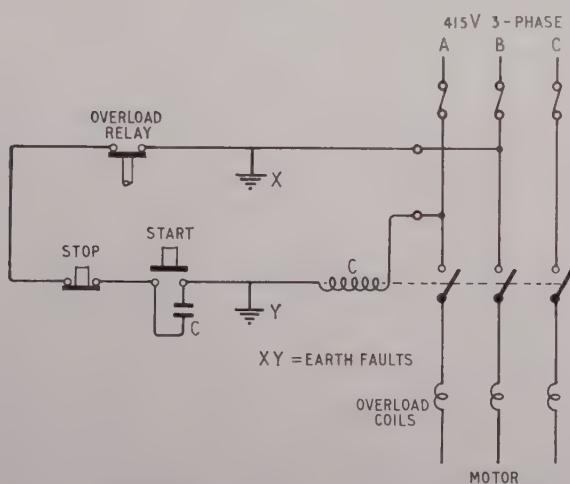


Fig. 1.—A bad example of a control circuit for a motor contactor

### Interlocks

Auxiliary contacts are an important feature and care should be taken when ordering or designing gear to cater for spare contacts or at least provide facilities for their future adaptation. Arrangements should be made so that an auxiliary contact can be quickly changed from "normally closed" to "normally open" or vice versa.

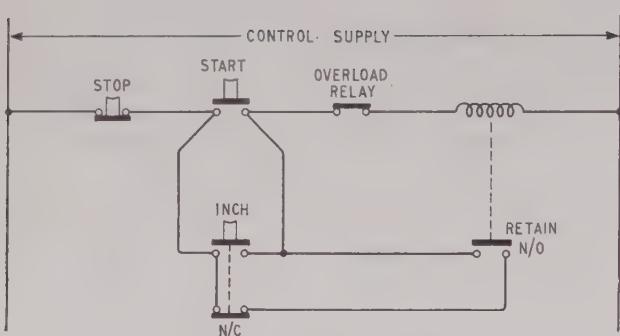


Fig. 3.—With this circuit it is possible to obtain motor "run-on" when the inch button is released

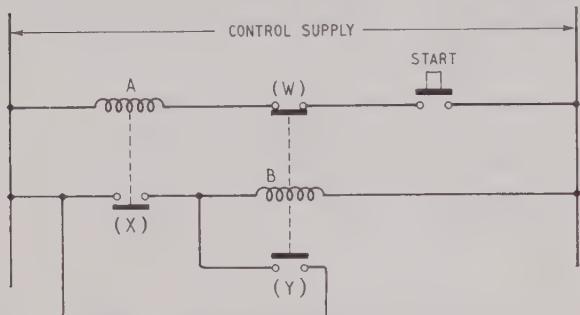


Fig. 4.—Hunting can occur with this circuit

Sequence circuits and interlocks can be made unnecessarily complex by undue concentration on the prevention of remote possibilities of failure or attempting to render the whole gear "absolutely foolproof." A little intelligence on the part of the operators must be assumed if the costs, both initial and running, are to be kept within reasonable bounds. On the other hand, circuits like those shown in Figs. 3 and 4 indicate that the desire to economise in relays has been taken to extremes. Both arrangements are unsafe and unreliable. It is possible in the case of Fig. 3 for the inching button to be smartly released and the coil to continue to be energised due to the retainer circuit being completed before the contactor has had time to open. The operator expects the machine to stop after releasing the inching button and therefore the unexpected "run-on" may cause an accident.

Fig. 4 is an attempt to cause coil B to cut off coil A after A has closed B circuit through x. It will be readily seen that if contact W is opened before coil B has closed contact y, B will not be retained and in turn will allow W to close and initiate the cycle once more and this cycle may continue indefinitely or it may operate in such a manner intermittently. In both Figs. 3 and 4 the introduction of another relay eliminates all such troubles and renders the circuits reliable.

Each auxiliary circuit should be controlled by its own auxiliary contact on the contactor or by a separate small relay. A practice prevalent some years ago was to connect pilot lights in parallel with their respective operating coils. If the a.c. coil voltage was too high for lighting, a few turns of wire round the magnet coil was used to obtain a transformer action to provide a suitable supply for the lamp. This method was abandoned when it was found that lamp life was shortened considerably by the make and break transients of the coil.

When an a.c. electro-mechanical brake is included in the plant to be controlled by contactor gear, a common

practice is to connect the brake coil or coils (if it is two- or three-phase) in parallel across the terminals of the motor with which the brake is associated. To ensure a quicker application of the brake, a better way, though costing a little more, is to arrange for an auxiliary contact on the motor contactor to control a brake relay. This prevents motor discharge currents delaying brake application on switch-off of the motor. Such delays can be appreciable, particularly if the motor has its power factor corrected by a parallel-connected capacitor.

### Timing Devices

Many circuits include timing devices to ensure correct sequence operation of contactors and, if these are not chosen with due regard to their duty, a great deal of trouble is in store for the harassed maintenance engineer. Such timing is usually effected by one of the following methods:—(1) Simple oil dashpot; (2) clockwork escape- ment; (3) pneumatic cylinder; (4) capacitor discharge circuit; (5) residual magnetic appliances; (6) "slugging" of d.c. coils by discharge resistance or copper sleeve; (7) mechanical drive from plant controlled; and (8) thermal devices.

Oil dashpot systems are satisfactory only if a liquid medium is used which is not greatly susceptible to wide ambient temperature variations. A silicone-based liquid is very suitable. Clockwork mechanism can cause trouble unless the gear work is very well cut and assembled. The pneumatic cylinder or diaphragm is very reliable but is usually costly. The remaining devices are normally reliable in operation and have the virtue of providing a finer vernier adjustment of time. In the case of item 4, it may be found that electrolytic capacitors will prove less reliable than the standard types. When a selector switch is employed as a mechanical drive, one should be chosen which possesses both facilities for a close setting and also ease and accuracy of adjustment. Contacts should preferably be cam operated.

### Thermocouples Described

A third edition of "Noble Metal Thermocouples," by H. E. Bennett, has been published by Johnson, Matthey & Co., Ltd. The book describes the development of the noble metal thermocouple, its applications and methods of calibration. Curves of temperature against e.m.f. are given for many types of couples incorporating alloys of the platinum group metals, and a chapter describes the chief causes of deterioration in service. A new feature of the present edition is a short section summarising the behaviour of the many thermocouple combinations that have been proposed, and recommending those most suitable for particular applications. The book is available free on application to the company at 73-83, Hatton Garden, London, E.C.1.

### ELECTRIFICATION CONFERENCE PROCEEDINGS

The proceedings of last year's conference on railway electrification using the 50 c/s system are to be published in book form next April. It will include the full text of 42 conference papers and reports of the ensuing technical discussions. Copies of the proceedings, which will contain some 125,000 words and about 125 photographs and 175 diagrams, may be ordered in advance direct from the Publicity Officer, British Transport Commission, 222, Marylebone Road, London, N.W.1, price £5 each.

# Electrical Engineers Exhibition

21 - 25 MARCH

## PREVIEW

The tenth Electrical Engineers Exhibition opens at Earls Court next Tuesday at 10 a.m. The official opening ceremony will be performed by the Rt. Hon. F. J. Erroll, M.P., Minister of State, Board of Trade, at 12 noon. The exhibition will be open from Tuesday to Saturday from 10 a.m. to 7 p.m. (9 p.m. on Wednesday). Admission will be by ticket or trade card

**T**HE theme of this year's display, organised by the Electrical Engineers Exhibition (A.S.E.E.), Ltd., is communications, the emphasis being on railway and telephone equipment. The bulk of the display will, however, be concerned with power supply, industrial, commercial and domestic products. Over £2 million worth of equipment will be shown by over 470 companies.

### Railway Feature

In the Communications Feature display area on the first floor, the British Transport Commission will show, in conjunction with British Railways and London Transport, many of the recent developments in the electrical engineering aspects of railway modernisation as well as representative examples of standard apparatus. The main feature will be an "O" gauge model railway (18ft by 15ft) forming an inner and outer circle with two double junctions. It will be provided with overhead line equipment and will be controlled on the route-setting principle from an adjacent signal box. One junction will be controlled by the conventional relay method and the other by an electronic system of interlocking which is shortly to be used on British Railways as a prototype. In addition to signalling control panels and the track mimic diagram in the signal box, there will be a simplified form of train description and telephone equipment.

Below the model railway there will be a section of full-size permanent way complete with ballast and including a set of electrically-controlled points. A station platform, which will be used to demonstrate the latest types of station illumination, will be built alongside this standard track together with an automatic electro-mechanically-operated level crossing barrier and the signal box controlling the model railway. Colour-light signals will be placed adjacent to the full-size track to demonstrate four-aspect signalling.

Another exhibit will be British Railways' standard automatic warning system (A.W.S.) demonstration panel, with full-size inductors on the permanent way. Although most of the exhibits will be working equipment, which, including the model railway, can be operated by the public, there will be numerous static displays such as various types of cable and a display of immunisation of track circuits and line-side conductors from the effects of 25 kV, 50 c/s traction supply. Research work on signalling relays, recorders for movement information, controlling equipment for electrical power supply, etc., will also be featured. In adjoining display rooms, manufacturers in the field of railway electrification will show their latest equipment.

### Telecommunications

The Communications Feature will also contain a display by the General Post Office. This will include a demonstration of the latest subscriber trunk dialling (S.T.D.) techniques and demonstrations of the speed and efficiency of the United Kingdom telex services. There will also be working demonstrations of an amplifier and receiver for echo work to give reception from a satellite, and a colour television display operating over a closed circuit from the B.B.C. Television Centre. In this section, the static display will include new plastic type cables, lightweight submarine cables and equipment for main-line transmission.

### Other Features

Apart from the Communications Feature there will be two other items of general interest. The first of these will be the world's largest moving-coil meter, about 17ft square, which will overlook the exhibition. The meter scale will be more than 20ft long and it will show the total electrical load connected during the exhibition. It

will be mounted on the first floor by the Warwick Road entrance and the total weight of the instrument's movement will be over 3 cwt. The scale will be calibrated 0-5 MW and a 5ft long aluminium pointer will be used for indication. The movement and dial have been designed and constructed by Nalder Bros. & Thompson, Ltd. A special current transformer will be coupled to the main intake to Earls Court from the London Electricity Board's supply. The second item will be a lighting display in the entrance foyer which will include a combination of sound, light and colour with continually changing effects.

Up-to-date and authoritative books on various electrical subjects will be displayed on the *Electrical Review* stand (A6) and during the course of the exhibition representatives will be available to deal with inquiries.

### General Exhibits

In the following pages we give stand-by-stand descriptions of the principal exhibits which will be on view. From this, it will be seen that so many new and interesting designs of equipment will be displayed that it is a very difficult task to provide a brief selection. We do, however, give below an abridged list of some of these exhibits.

On the A.E.I. (Instrumentation) stand there will be a demonstration of a system designed for the automatic control of turbines during run-up, while on the A.E.I. (Woolwich) stand a section of the 200 V d.c. cable for the cross-Channel link will be shown. A resin-filled cable joint for use with plastic-insulated power cables will be demonstrated on Aerialite's stand, Ashley Accessories will show their safety switch sockets, and Bakelite will display h.f. cables insulated with their cellular polyethylene. The "trickle" impregnation technique for high-speed machine tool armatures using an epoxy resin will be shown by Dr. Beck & Co., while the effectiveness of epoxy encapsulation will be demonstrated by Brook Motors.

The application of silicon rectifier switches for motor speed control will be demonstrated by Brush, and Bryce will be showing a distribution transformer having aluminium foil windings. "Diamond H" will show a prototype hotplate controller which thermostatically controls the temperature of liquid in a cooking utensil on the hotplate. Transistorised logical elements will be demonstrated by the English Electric Co. with a working model of a mine car circuit, showing how these cars can be removed from a cage, emptied and returned automatically. A new design of a three-phase saturable reactor/transductor will be shown by Haddon Transformers.

A new switch shown by Honeywell operates without physical contact and has no moving parts. Klippon will show an instrument terminal designed with a stepless adjustable resistance to compensate for differences between actual external resistance and the external resistance for which the instruments are calibrated. The automatic power factor regulator to be shown by Londex has been designed for h.f. induction heating plants. Mawdsley's will display a new variable-speed reversible a.c. motor, and epoxy encapsulation for motors up to 125 h.p. will be exhibited by Newman Industries.

The progress in design of electric motors and generators is demonstrated in a display on the Pinchin, Johnson stand. Most of the motors shown have been drawn from various private and public museums. Printed armatures for small electric motors are shown on the Printed Circuit stand. A magnetic instrument bearing will be demonstrated by Sangamo Weston, while Standard Telephones & Cables will demonstrate their "packaged" supervisory system for remote control and indication.

Full details of these and all other exhibits are given below. Our next week's issue will contain a survey of some of the more interesting exhibits.

## STAND-BY-STAND PREVIEW

### AC-DELCO (EII)

Motors for light duty and domestic appliances. Those shown include capacitor start and split phase induction motors and series wound universal motors.

*AC-Delco Division of General Motors, Ltd., Dunstable, Beds.*

### A.C. INDUSTRIES (XI)

Transformers, chokes, auto-transformers, saturable reactors, short-turns testers, h.v. test sets, and coil winding.

*A.C. Industries, 15, Victoria Avenue, Camberley, Surrey.*

### THE ADMIRALTY (O16)

Examples of internal ship communications, as embodied in the nuclear submarine H.M.S. *Dreadnought*, are shown on this stand. Details are given of the opportunities and training given to officer and rating recruits in the electrical branch of the Navy.

*The Admiralty, Whitehall, London, S.W.1.*

### A.E.I. LAMP & LIGHTING (K15)

Fluorescent and filament lamps and lighting fittings. The superior colour rendering qualities of the Mazda "Kolor-rite" fluorescent lamp can be appreciated since it is used for the general illumination of the stand. The new "Netaline" 4ft fluorescent fitting for commercial and domestic use is prominently displayed together with the Series 2 range. The "Amberline" floodlighting fitting designed for use with the 200 W linear sodium lamp is also shown. The industrial and commercial application of the new small size 300 W G.L.S. lamp is demonstrated and a new high efficiency 1 kW MBF reflector fitting is also shown.

*The A.E.I. Lamp & Lighting Co., Ltd., Melton Road, Leicester.*

### A.E.I. (MANCHESTER) (INSTRUMENTATION DIV.) (L7)

Relays and instruments. Apart from the display of protective relays of both draw-out and fixed-element pattern,

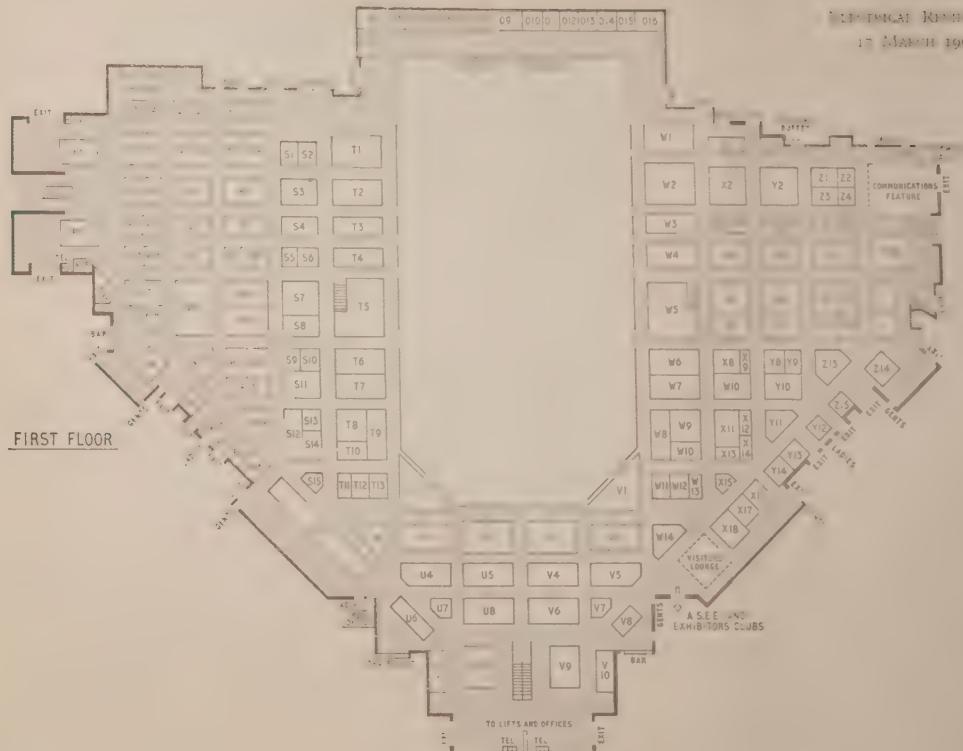
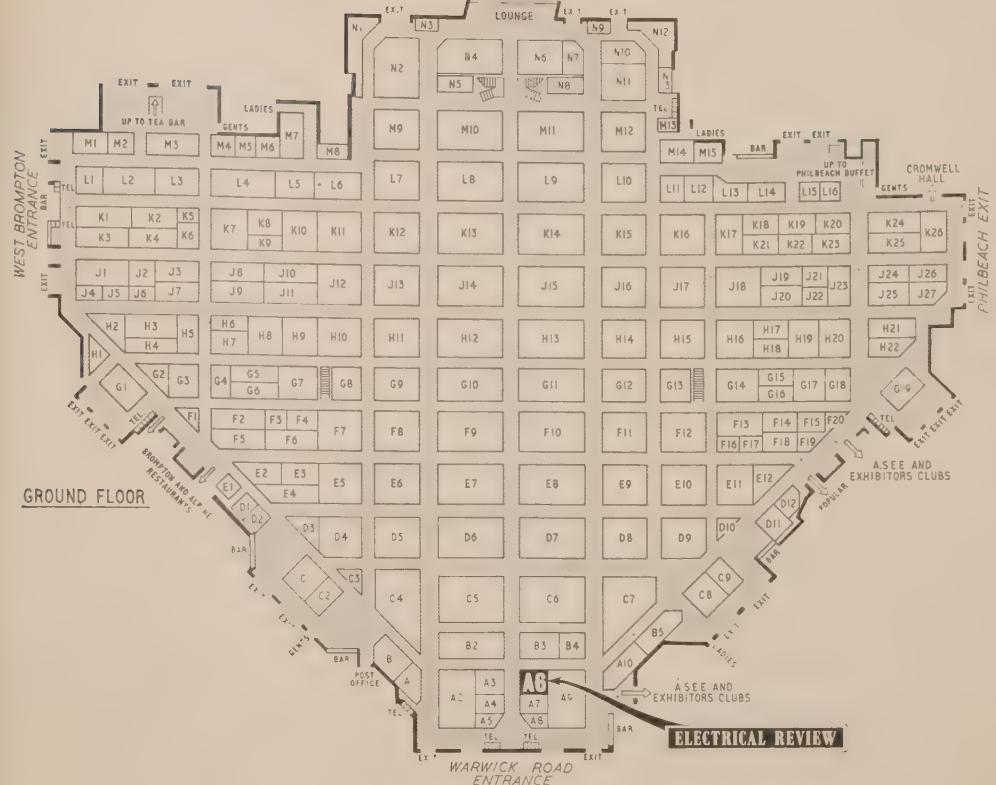
there is a demonstration of equipment connected with the recently developed A.E.I. system for automatic control of turbines during run-up. A.c. and d.c. indicating instruments and single and polyphase meters, including the single-phase house-service pattern, with cyclo-meter register are shown. New items include the type NJO power factor correction relay in wall-mounting case and a drawn-out version of the type AVE3 relay for automatic voltage regulation.

*Associated Electrical Industries (Manchester), Ltd. (Instrumentation Division), Trafford Park, Manchester, 17.*

### A.E.I. (MANCHESTER) (SWITCH-GEAR DIV.) (G11)

All types of switchgear and accessories. The largest exhibit on this stand is one phase of a 275 kV 15,000 MVA centre-rotating post isolator, incorporating a type MLGO electro-hydraulic mechanism. Another exhibit is a medium-voltage packaged substation incorporating a 500 kVA 11,000/

## "ELECTRICAL REVIEW" GUIDE TO THE ELECTRICAL ENGINEERS EXHIBITION



## ALPHABETICAL LIST OF EXHIBITORS

Exhibitor	Stand No.	Exhibitor	Stand No.	Exhibitor	Stand No.
<b>AC-Delco Division of General Motors, Ltd.</b>	E11	Bridges (S. N.) & Co., Ltd.	X10	<b>Dahl Brothers, Ltd.</b>	N3
A.C. Industries	X1	British Electric Resistance Co., Ltd.	M2	Dale Electric (Yorkshire), Ltd.	T14
Admiralty, The	K15	British Electrical & Allied Industries Research Association (see E.R.A.)	B3	Davis Sheet Metal Engineering Co., Ltd.	G4
A.E.I. Lamp & Lighting Co., Ltd.	L7	British Electrical Repairs, Ltd.	F12	Delta Technical Services, Ltd.	L1
A.E.I. (Manchester), Ltd., Instrumentation Division	G11	British Insulated Callender's Cables, Ltd.	F10	Dennix (G. P.), Ltd.	G7
A.E.I. (Manchester), Ltd., Switchgear and Transformer Divisions	K14	British Klockner Switchgear, Ltd.	H114	Dex Industries, Ltd.	M13
A.E.I. (Rugby), Ltd., Motor and Control Gear, Electronic Apparatus, and Heavy Plant Divisions	F9	British Transformer Co., Ltd.	M14	Diamond H <sup>®</sup> Switches, Ltd.	J8
A.E.I. (Wolverwich), Ltd.	K11	British Resistor Co., Ltd.	M18	Domestic Electrical Appliances	P8
Allis-Chalmers, Ltd.	C3	British Standards Institution	O3	Donovan Electrical Co., Ltd.	F2
Agro Electrical Co., Ltd.	Z10	Brook Motors, Ltd.	M12	Dorman & Smith, Ltd.	J5
Aircraft-Marine Products (Gt. Britain), Ltd.	Z15	Brownie's Electric Co., Ltd.	F8	D.P. Battery Co., Ltd.	H14
Albright (Engineers), Ltd.	S12	Bruce Peebles & Co., Ltd.	V1	D.S. Plugs, Ltd.	H14
Alcan Industries, Ltd.	N2	Brunt Variable Speed Motors, Ltd.	X17	Dubilier Condenser Co. (1925), Ltd.	K20
Allen West & Co., Ltd.	U5	Brush Electrical Engineering Co., Ltd.	C6	Dyson & Co, Enfield (1919), Ltd.	X2
Allied Insulators, Ltd.	H14	Bryce Electric Construction Co., Ltd.	M9		
Alorite, Ltd.	W7	Bullers, Ltd.	U5		
Armstrong Whitworth Equipment	J12	Bulpitt & Sons, Ltd.	H19	<b>Easipower Appliances, Ltd.</b>	W5
Armstrong Switches, Ltd.	R7	Burgess Products Co., Ltd.	D11	E.C.C. (Moulded Breakers), Ltd.	F11
Artherton Resistance Co., Ltd.	F5	Cable Covers, Ltd.	U10	E.F. Electric, Ltd.	F19
Ashley Accessories, Ltd.	O9	Carr Fastener Co., Ltd.	S6	Ekco-Ensign Electric, Ltd.	F7
Association of Supervising Electrical Engineers	F5	Carter Electrical Co., Ltd.	S1	Electran Coil Co., Ltd.	U5
Astral Switchgear, Ltd.	J16	Cary (William E.), Ltd.	K6	Electric Construction Co., Ltd.	K17
Atlas Lighting, Ltd.	Z17	Catalystic, Ltd.	T1	Electrical Apparatus Co., Ltd.	O1
Austinline, Ltd.	Q11	Central Electricity Generating Board	B2	Electrical Association for Women	B4
Austin Motor Co., Ltd.	Z6	Chamberlain & Hookham, Ltd.	Z4	Electrical Development Association	S16
<b>B. &amp; R. Relays, Ltd.</b>	C2	Chapman & Hall, Ltd.	F16	Electrical Division of Radiation, Ltd.	O10
Backer Electric Co., Ltd.	K8	Chilton Electric Products, Ltd.	L10	Electrical Industries Benevolent Association	A4
Bakelite, Ltd.	J20	Chloride Batteries, Ltd.	K21	Electrical Industries Export	H7
Baldwin (H. J.) & Co., Ltd.	P7	Churchouse (C. M.), Ltd.	R5	Electrical Journal	L16
Banska Electric Motors, Ltd.	Z9	Clare Instrument Co.	J24	Electrical Remote Control Co., Ltd.	B3
Bayliss, Jones & Bayliss, Ltd.	V9	Clark (H.) & Co. (Manchester), Ltd.	G3	Electrical Research Association (E.R.A.)	O5
Beck, Dr., & Co. (England), Ltd.	N13	Clifford & Snell, Ltd.	J23	Electrical Review	A2
Beckett & Parker, Ltd.	C1	C.M.P. Glands, Ltd.	X18	Electrical Times	O5
Belmos Co., Ltd.	L9	Cole (E. K.), Ltd.	Y3	Electrical Trade Union	G15
Benjamin Electric, Ltd.	C7	Communications Feature	T12	Electrical Wholesalers' Federation	L14
Bertram Thomas (Engineers), Ltd.	L8	Connollys (Blackley), Ltd.	F6	Electro Dynamic Construction Co., Ltd.	G15
Bill Switchgear, Ltd.	H19	Contactum, Ltd.	Z17	Electro Mechanical Manufacturing Co., Ltd.	J14
B.K.W. Electric Motors, Ltd.	W7	Controlled Heating Units (London), Ltd.	Z13	Electro Methods, Ltd.	F14
Blackburn Electrical Co., Ltd.	K5	Copper Developments Association	G15	Elliott Bros. (London), Ltd.	D7
Blackwell (F.G.) & Co., Ltd.	C8	Corner (George) & Co., Ltd.	G1	Ellis, Evans & Jackson, Ltd.	G4
Bolton Thompson & Sons, Ltd.	S11	Corporation Power (Electrical), Ltd.	M10	E.M.S. Electrical Products, Ltd.	G18
Bosch, Lorenz & Co., Ltd.	R12	Craibtree (I. A.) & Co., Ltd.	K10	Enfield-Standard Power Cables, Ltd.	T10
Bonniels (D. H.) & Son, Ltd.	O12	Crawley College of Further Education	O11	Engelhard Hanovia Lamps	T10
Borough Polytechnic	L14	Cressall Manufacturing Co., Ltd.	K24	Engineering Industries Group Apprenticeship (E.I.G.A.)	O1
Bourner (F. H.) (Fixings), Ltd.	T5	Critchley Bros., Ltd.	R15	Engl. (J.), Ltd.	S5
Boweshorpe Electric Co., Ltd.	Y7	Crompton Parkinson, Ltd.	J15	English Electric Co., Ltd.	M11 & T10
Bray (E. N.), Ltd.	J2	Crossland (R. & A. G.), Ltd.	M7	Equipment & Services, Ltd.	L10
Bray (George) & Co., Ltd.					

Exhibitor	Stand No.	Exhibitor	Stand No.	Exhibitor	Stand No.	
Erma, Ltd. Erskine Heap & Co., Ltd. Ester, Ltd. Ether, Ltd. Everett Edgcumbe & Co., Ltd. Everesh and Vignoles, Ltd. Expanded Metal Co., Ltd. Expert Industrial Controls, Ltd.	S14 A9 W3 J26 C4 C1 K24 P17	Heenan & Froude, Ltd. Hellermann, Ltd. Hendrey Relays, Ltd. Hepworth Iron Co., Ltd. Herman Smith Smithrite, Ltd. Heywood & Co. Hilmor, Ltd. Hirst Electronic, Ltd. Holophane, Ltd. Hood, Ltd., Ltd. Honeywell Controls, Ltd. Hoover, Ltd. T3 K4 C65 S13 U6 N9 V8 E1 U1 J16 E7 D5 J7 Z7 L4	Iondex, Ltd. London Electric Wire Co. & Smiths, Ltd. London Fan & Motor Co., Ltd. London Transformer Products, Ltd. Long & Crawford, Ltd. Lord's Controls, Ltd. M5 Lucy (W.) & Co., Ltd. Lumitron, Ltd. G6 G9 J1 S7 X7 N1 P9 P11 Q2	W11 T5 Z3 V4 U3 P18 M5 L12 G6 G9 J1 S7 X7 N1 P9 P11 Q2	London, Ltd. London Electric Wire Co. & Smiths, Ltd. London Fan & Motor Co., Ltd. London Transformer Products, Ltd. Long & Crawford, Ltd. Lord's Controls, Ltd. Lucy (W.) & Co., Ltd. Lumitron, Ltd. Lupus Electrical Products, Ltd. Lyon (Arthur) & Co. (Engineers), Ltd.	G8 L5 L2 T1 XI Z1 F1 J25
Falk, Stadelmann & Co., Ltd. Faraday House Engineering College Fawcett Preston & Co., Ltd. Fenton, Burn & Co., Ltd. Ferranti, Ltd. Fibreglass, Ltd. Fitzgerald & Son, Ltd. Filhol (J. P.), Ltd. First Cleveland Instruments, Ltd. Fitzgibbon & Murray, Ltd. Formica, Ltd. Forrest (George) & Son, Ltd. Foster Transformers, Ltd. Fractional H.P. Motors, Ltd. Friedland (V. E.), Ltd. Frost (H.) & Co., Ltd. Fuller Electric, Ltd.	K13 O17 T3 K4 C65 S13 U6 N9 V8 E1 U1 J16 E7 D5 J7 Z7 L4	Horizon, Ltd. Honeywell Controls, Ltd. Hoover, Ltd. Horstmann Gear Co., Ltd. (A. H.) (Capacitors), Ltd. Huntton, Ltd. Hurseal, Ltd. H.V.E. (Electric), Ltd. Iford, Ltd. Imhof (Alfred), Ltd. Imperial Chemical Industries, Ltd. (Metals, Nobel & Plastics Divisions) Industrial Tapes, Ltd. Institution of Electrical Engineers Insuloid Manufacturing Co., Ltd. International Rectifier Co. (Great Britain), Ltd. Ioco, Ltd. Irish Cables, Ltd. Isopad, Ltd.	R4 Z12 T13 F20 O7 & O8 Z11 Y10 X8 R6 K9	Mackie W. & Co., Ltd. Macrae, Robins & Co., Ltd. Mag cook Appliances, Ltd. Magnesia & Specialty Alloys, Ltd. Magnetic Devs, Ltd. Major Equipment Co., Ltd. Mante Metalworkers, Ltd. Marbourn, Ltd. Marrett & Place Ltd. Martindale Electric Co., Ltd. Mawson, Ltd. M.B. Metals, Ltd. M.B. Packagings Ltd. M. & C. Sw. Gear, Ltd. M.C.B. Co., Manchester, Ltd. McGeoch (W. V. M.) & Co., Ltd. Mersey Cable Works Ltd. Metco & Co., Ltd. Metco Extrusion Industries, Ltd. Metco & Constructors Co., Ltd. Midland Bank, Ltd. Midland Electric Manufacturing Co., Ltd. Miller William (Newcastle), Ltd. Miles Levers (Engravers), Ltd. Minerva Mouldings, Ltd. Minnesota Mining & Manufacturing Co., Ltd. MK Electric, Ltd. Mond Nickel Co., Ltd. Morgan Aircraft, Ltd. Morecambe Electrical Equipment Co., Ltd. Morgan Components, Ltd. Morgan Crucible Co., Ltd. Morganite Resistors, Ltd. Morphy-Richards, Ltd. (Astral, Cray and Installations Divisions) M.T.E. Control Gear, Ltd. Muillard, Ltd.	X4 H21 Q6 H6 W12 H2 J11 D10 D12 B19 P19 P19 K7 F1 E10 J27 H13 W3 H13 X6 D6 Q1 L5 E4 D5 D5 S7 Q7 T6 H5 H5 H5 H5 K5 K5 G16 K2 Z14	
Gainsborough Engineering Co. (Oldham), Ltd. General Controls, Ltd. General Electric Co., Ltd. Gent & Co., Ltd. Giffex Conduits, Ltd. Glover (W. T.) & Co., Ltd. Gordon Miller, Ltd. G.P.O. London Telecommunications Region (Telex Service) Graphite Products, Ltd. Greenbaum Electric Conduits, Ltd. Gruv Engineering Co., Ltd. Gulf Oil (Great Britain), Ltd. G.W.B. Furnaces, Ltd.	Q3 P15 H12 & V2 K22 X15 Q10 P14 Z17 H5 R14 Y10 G13 BS	Jeary Electrical Co., Ltd. Johnson (Richard) & Nephew, Ltd. Johnson & Phillips, Ltd. Jones and Stevens, Ltd. Jones (Walter) & Co. (Engineers), Ltd. Kennon, Irvine & Co., Ltd. Kent Bros., Electric Wire Co. & E. H. Phillips, Ltd. Klixcon, Ltd. Klippon Electricals, Ltd. Kuhne (H.), Ltd.	P16 K16 J13 H1 W10 P16 N10 Q4 Y1 S15 E7 A2 J26 S2 J3 N11 R11 E3 K25 T5 T8 R8	Laboratory Equipment (London), Ltd. Lancashire Dynamo & Crypto, Ltd. Lancashire Dynamo Electronic Products, Ltd. Lancashire Dynamo Nevelin, Ltd. Langham Thompson (J.), Ltd. Langley London, Ltd. Laurence, Scott & Electromotors, Ltd. Lee Guinness, Ltd. Lewden Metal Products, Ltd. Light & Power Accessories Co., Ltd. Line Equipment, Ltd. Linton and Hirst, Ltd. Lloyds Bank, Ltd.	National Inspection Council for Electrical Installation Contracting National Pressure Cooker Co. (England), Ltd. Nettles Accessories, Ltd.	GI O2 S6 K11 (Continued overleaf)
Hackbridge Cable Co., Ltd. Hackbridge and Hewittic Electric Co., Ltd. Haddon Transformers, Ltd. Harmer & Simmonds, Ltd. Harris & Sheldon (Electrical), Ltd. Harvey (J. J.) & Pressurecast, Ltd. Harvey Hubbell, Ltd. Hawks Cable Glads, Ltd. Hawkins (G.) & Co., Ltd. Heatwest Electric, Ltd. Hearne, Ltd. Heaibyard (F. C.) & Co., Ltd. Hedin, Ltd.	M9 C7 R13 T1 D4 P16 Y9 S10 L13 E2 M4 J22 M14					

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## ALPHABETICAL LIST OF EXHIBITORS [continued]

Exhibitor	Stand No.	Exhibitor
Newman Industries, Ltd.	K12	Sangamo Weston, Ltd.
Newton Bros. (Derby), Ltd.	K12	Sankey (Joseph) & Sons, Ltd.
Nife Batteries	G5	Santon, Ltd.
Nobrac Carbon, Ltd.	P19	Sax (Julius) & Co., Ltd.
Norbury Watch Co., Ltd.	P14	Scholes (Geo. H.) & Co., Ltd.
Northern Polytechnic N.S.F., Ltd.	O13	Scott (Geo. L.) & Co., Ltd.
Otter Controls, Ltd.	X3	S.G.E. Signals, Ltd.
Ottermill Switchgear, Ltd.	T11	Shane Control Gear, Ltd.
P. & B. Engineering Co., Ltd.	G14	Shell Chemical Co., Ltd.
P. & R. Electrical (London), Ltd.	M6	Siemens-Schuckert (Great Britain), Ltd.
Parfeko, Ltd.	P12	Sifam Electrical Instrument Co., Ltd.
Parmiter, Hope & Sugden, Ltd.	Y11	Simmonds Aerocessories, Ltd.
Partridge Wilson & Co., Ltd.	J17	Simplex Electric Co., Ltd.
Perkins (John M.) & Smith, Ltd.	A7	S.L.R. Electric, Ltd.
Permal, Ltd.	X13	Small Electric Motors, Ltd.
Peterkin, Ltd.	Y5	Smith (Frederick) & Co.
Philips Electrical, Ltd.	H9	Smith Metres, Ltd.
Pinchin Johnson & Co.	P10	Smiths Clock & Watch Division
Pirelli-General Cable Works, Ltd.	J14	Sofora Electrical Division of Federated Foundries, Ltd.
Plessey Co., Ltd.	Y2	South London Electrical Equipment Co., Ltd.
Poles, Ltd.	U8	South Wales Switchgear, Ltd.
Power Centre Co., Ltd.	S4	Sowerby Ellison, Ltd.
Power Connectors, Ltd.	H15	Square D, Ltd.
Precision Engineering Equipments, Ltd.	A1	Standard Insulator Co., Ltd.
Printed Circuits, Ltd.	P13	Standard Telephones & Cables, Ltd.
Pritchett & Gold and E.P.S. Co., Ltd.	L5	St. J. G. & Co., Ltd.
Process Control Gear, Ltd.	F7	Statite & Porcelain Products, Ltd.
Pullin (R. B.) & Co., Ltd.	J4	Sterling Cable Co., Ltd.
Pye, Ltd.	J27	Sterling Light Co., Ltd.
Pyronex, Ltd.	Z16	Stream-Line Filters, Ltd.
Radiation, Ltd., Electrical Division of Radiovisor Parent, Ltd.	G9	Sullivan (S. D.), Ltd.
Rawlplug Co., Ltd.	S16	Suntex Safety Glass Industries, Ltd.
Record Electrical Co., Ltd.	R10	Swifts of Scarborough, Ltd.
Remploy, Ltd.	L6	Switchgear & Cowans, Ltd.
Revo Electric Co., Ltd.	A10	Symons (H. D.) & Co., Ltd.
Revco (A. G. & Co.), Ltd.	R9	Synchronome Co., Ltd.
Rheostat Co., Ltd.	D9	Taylor, Tunnicliff & Co., Ltd.
Rhodes (S. A.), Ltd.	L3	Taylor, Tunnicliff (Refractories), Ltd.
Rist's Wires & Cables, Ltd.	Q3	Technical Press, Ltd.
Robinson (D.) & Co., Ltd.	S8	Technograph Electronic Products, Ltd.
Rodene Electrical Co., Ltd.	Y3	Telcon-Magnetic Cores, Ltd.
Roleco Engineering, Ltd.	D1	Telemeters, Ltd.
Rosite, Ltd.	S4	Temco, Ltd.
Ross, Courtney & Co., Ltd.	W2	Territorial Army
Rowlands Electrical Accessories, Ltd.	E5	Teter Engineering Co., Ltd.
Royal Worcester Industrial Ceramics, Ltd.	P4	Thermaline Components, Ltd.
Sams Electrical London Ltd.	U7	Thermair Domestic Appliances, Ltd.
Sanders (Wm.) & Co., Ltd. (Wednesbury), Ltd.	K3	Thermaloy, Ltd.

## EXHIBITORS' STANDS IN NUMERICAL ORDER

A		G14	Ottermill Switchgear, Ltd.
A1a	Veritys (Maxlume), Ltd.	E5	Rowlands Electrical Accessories, Ltd.
A1b	Power Connectors, Ltd.	E6	Walsall Conduits, Ltd.
A2	Lancashire Dynamo Electronic Products, Ltd.	E7	Foster Transformers, Ltd.
A3	Electrical Times	E8	Lancashire Dynamo & Crypto, Ltd.
A4	Electrical Industries Export	E9	Lancashire Dynamo Nevelin, Ltd.
A5	Electrical Wholesalers' Federation	E10	Standard Telephones & Cables, Ltd.
A6	Electrical Review	E11	William McGeoch & Co., Ltd.
A7	Partridge, Wilson & Co., Ltd.	E12	Veritys (Maxlume), Ltd.
A8	Shaw Publishing Co., Ltd.	H1	AC-Delco Division of General Motors, Ltd.
A9	Erskine, Heap & Co., Ltd.	E12	Wandsworth Electrical Manufacturing Co., Ltd.
A10	Record Electrical Co., Ltd.	H1	Jones & Stevens, Ltd.
B		H4	S.L.R. Electric, Ltd.
B1	Martindale Electric Co., Ltd.	F1	Lupus Electrical Products, Ltd.
B2	Central Electricity Generating Board	F2	Donovan Electrical Co., Ltd.
B3	Electrical Research Association	F3	Shel Chemical Co., Ltd.
B4	Electrical Development Association	F4	Uni-Tubes, Ltd.
B5	G.W.B. Furnaces, Ltd.	F5	Ashley Accessories, Ltd.
C		H6	Astral Switchgear, Ltd.
C1	Evershed & Vignoles, Ltd.	F6	V.G. Cole, Ltd.
C2	Backer Electric Co., Ltd.	F7	Eko-Esign Electric, Ltd.
C3	Agro Electrical Co., Ltd.	F8	Browning's Electric Co., Ltd.
C4	Belmos Co., Ltd.	F9	Associated Electrical Industries (Woolwich), Ltd.
C5	Everett, Edgcumbe & Co., Ltd.	F10	British Insulated Callender's Cables, Ltd.
C6	Bell Electrical Engineering Co., Ltd.	F11	E.C.C. (Moulded Breakers), Ltd.
C7	Bertram Thomas (Engineers), Ltd.	F12	Electric Construction Co., Ltd.
C8	Hackbridge & Hewitric Electric Co., Ltd.	F13	British Electrical Repairs, Ltd.
C9	Boiton (Thomas) & Sons, Ltd.	F14	F. W. Thorpe, Ltd.
	Venner, Ltd.	F15	Elliott Brothers (London), Ltd.
	Venner Electronics, Ltd.	F16	Wire Products & Machine Design, Ltd.
D		F17	Edgerton, Hall, Ltd.
D1	Rolco Engineering, Ltd.	F18	Welbeck Trading Co., (London), Ltd.
D2	Clare Instrument Co.	F19	E.F. Electric, Ltd.
D3	Fractional H.P. Motors, Ltd.	F20	Industrial Tapes, Ltd.
E		G1	Nalder Bros. & Thompson, Ltd.
E1	Fitzgibbon & Murray, Ltd.	G2	E.M.B. Co., Ltd.
E2	Heaventow Electric, Ltd.	G3	Santon, Ltd.
E3	Lewden Metal Products, Ltd.	G4	Davis Sheet Metal Engineering Co., Ltd.
E4	Minerva Mouldings, Ltd.	G5	Nif Batteries
	J. G. Statter & Co., Ltd.	G6	Holophane, Ltd.
		G7	G. Morris, Ltd.
		G8	Trunduct, Ltd.
		G9	Pyronex, Ltd.
F		G10	Wesnghouse Brake & Signal Co., Ltd.
F1		G11	Associated Electrical Industries (Manchester), Ltd. (Switchgear and Transformer Divisions)
F2		G12	Enfield-Standard Power Cables, Ltd.
F3		G13	Gulf Oil (Great Britain), Ltd.

## EXHIBITORS' STANDS IN NUMERICAL ORDER [continued]

Stand No.	Exhibitor	Stand No.	Exhibitor
H10	Thermoduct, Ltd.	Q2	V. & E. Friedland, Ltd.
J18	Thermostatic Controls Co.	J6	Thermofast Control Co.
G3	Thorpe (F. W.), Ltd.	F13	Dimplex, Ltd.
Z8	Tintometer, Ltd.	Y4	Varilectric, Ltd.
D8	Toolpro, Ltd.	H6	Mantel Metalworkers, Ltd.
W9	Tricity Cookers, Ltd.	J16	Arrow Electric Switches, Ltd.
Y12	Troughton & Young (Lighting), Ltd.	H16	Johnson & Phillips, Ltd.
P17	Troughton & Young (Manufacturers), Ltd.	H16	Crompton Parkinson, Ltd.
A8	Trunduct, Ltd.	G7	Atlas Lighting, Ltd.
F3	Tufnol, Ltd.	D7	George Forrest & Son, Ltd.
M9	Turner Brothers Asbestos Co., Ltd.	U9	Tricity Cookers, Ltd.
Q13	Turners Asbestos Cement Co., Ltd.	K26	Parmiter, Hope & Sudgen, Ltd.
V8	Tyler & Co., Ltd.	W2	Joseph Sankey & Sons, Ltd.
H13	Tyrad Electric, Ltd.	H16	William White (Switchgear), Ltd.
H4		X16	H. J. Baldwin & Co., Ltd.
H18	Ucan Development, Ltd.	F4	Thermat, Ltd.
L5	Uni-Tubes, Ltd.	X9	Wirehoms (Universal), Ltd.
Q5	Universal Installations Co., Ltd.		Poles, Ltd.
H8	Vactite Wire Co., Ltd.	L5	Circuit, Ltd.
P8	Vanguard Engineering Co.	T9	CIBA (A.R.L.), Ltd.
Q7	Varilectric, Ltd.	J9	Arthur Lyon & Co., (Engineers), Ltd.
S9	Venner Electronics, Ltd.	C9	Electro Methods, Ltd.
N6	Venner Electronics, Ltd.	C9	Ether, Ltd.
Q7	Vent-Axis Ltd.	V6	J. Langham Thompson, Ltd.
E10 & A1a		H10	Measuring Instruments (Pullin), Ltd.
E10 & A1a		H11	R. B. Pullin & Co., Ltd.
K		K1	Fenton, Byrn & Co., Ltd.
K1	Walker (W. G.) & Co. (Engineers), Ltd.	K6	M.T.E. Control Gear, Ltd.
K2	Walsall Conduits, Ltd.	E6	W.M. Sanders & Co. (Wedgesbury), Ltd.
K3	Walsdeside Cable Works, Ltd.	R6	Jeary Electrical Co., Ltd.
K4	Walsdeside Wire Co., Ltd.	E12	F. C. Blackwell & Co., Ltd.
K5	Watford Electric & Manufacturing Co., Ltd.	H11	W. G. Walker & Co. (Engineers), Ltd.
K6	Watford Electric & Manufacturing Co., Ltd.	K23	Bakelite, Ltd.
K7	Watford Trading Co., (London), Ltd.	H2	Isopad, Ltd.
K8	Westwood Switchgear, Ltd.	H2	Aerialite, Ltd.
K9	Westwood Brake & Signal Co., Ltd.	M15	Nettle Accessories, Ltd.
K10	Westwood Clock & Watch Co., Ltd.	H2	Newman Industries, Ltd.
K11	Westwood Electric & Manufacturing Co., Ltd.	J19	Falk, Stadelmann & Co., Ltd.
K12	Westwood Electric & Manufacturing Co., Ltd.	Q14	Associated Electrical Industries (Rugby), Ltd.
K13	Westwood Electric & Manufacturing Co., Ltd.	Q1	Marconi, Irvin & Co., Ltd.
K14	Westwood Electric & Manufacturing Co., Ltd.	J20	Power and Control Gear, Electronic Apparatus, Heavy and Plant Divisions
K15	W.H. Symons & Co., Ltd.	J10	E.I. Lamb & Lighting Co., Ltd.
K16	W.H. Symons & Co., Ltd.	S5	Richard Johnson & Nephew, Ltd.
K17	W.M. Sanders & Co., Ltd.	H17	Electrical Apparatus Co., Ltd.
K18	W.H. Symons & Co., Ltd.	H18	Thermofast, Ltd.
K19	Victor Products (Walsall), Ltd.	H19	George Corner & Co., Ltd.
K20	Dubilier Condenser Co. (1925), Ltd.	K21	Gainsborough Engineering Co. (Oldham), Ltd.
K21	Chloride Batteries, Ltd.	K22	S. A. Rhodes, Ltd.
K22	Gent & Co., Ltd.	K23	Klippon Electricals, Ltd.
K23	Ward & Ward, Ltd.	K24	Magicoil Appliances, Ltd.
K24	Cressall Manufacturing Co., Ltd.	K25	Moon Aircraft, Ltd.
K25	Expanded Metal Co., Ltd. (Electrical Division)	K26	S. H. Ellison Glass Works, Ltd.
K26	Light & Power Accessories Co., Ltd.		Suntex Safety Glass Industries, Ltd.
L		L1	Delta Technical Services, Ltd.
L1	London Transformer Products, Ltd.	L2	Minnesota Mining & Mfg. Co., Ltd.
L3	Rheostatic Co., Ltd.	L4	Fuller Electric, Ltd.
L4		L5	London Electric Wire Co. & Smiths, Ltd.
L5		L6	Millet Levens (Engravers), Ltd.
L6		L7	Printed Circuits, Ltd.
L7		L8	Frederick Smith & Co.
L8		L9	Vacuum Wire Co., Ltd.
L9		L10	Walsdeside Cable Works, Ltd.
L10		L11	Warren Wire Co., Ltd.
L11		L12	Ashburton Resistance Co., Ltd.
L12		L13	Lloyds Bank, Ltd.
L13		L14	Rempoly, Ltd.
L14		L15	Radiovisor Parent, Ltd.
L15		L16	Lee Guinness, Ltd.
L16		L17	D. H. Bonella & Son, Ltd.
L17		L18	Haddon Transformers, Ltd.
L18		L19	Greenwood Airvac Conduits, Ltd.
L19		L20	Critchley Bros., Ltd.
M		S1	Mond Nickel Co., Ltd.
M2	British Electric Resistance Co., Ltd.	S2	Langham Tools, Ltd.
M3	British Power Transformer Co., Ltd.	S3	Carter Electrical Co., Ltd.
M4	Synchronome Co., Ltd.	S4	Plesey Co., Ltd.
M5	Hearsea, Ltd.	S5	Rosin, Ltd.
M6	Hilmor, Ltd.	S6	J. Engl, Ltd.
M7	P. & B. Engineering Co., Ltd.	S7	E. W. Works, Ltd.
M8	British Resistor Co., Ltd.	S8	National Pressure Cooker Co. (England), Ltd.
M9	Bryce Electric Construction Co., Ltd.	S9	Thermair Domestic Appliances, Ltd.
H15	Hirst Electronic, Ltd.	S10	Hoover, Ltd.
H16	Troughton & Young (Lighting), Ltd.	S11	Rist's Wires & Cables, Ltd.
H17	Troughton & Young (Manufacturers), Ltd.	S12	South London Electrical Equipment Co., Ltd.
H18	Simpex Electric Motors, Ltd.	S13	Hawke Cable Glands, Ltd.
H19	Bullock & Sons, Ltd.	S14	Alcan Industries, Ltd.
H20	Stream-Line Filters, Ltd.	S15	Fibreglass, Ltd.
H21	Vokes Gensing, Ltd.	S16	Laboratory Equipment (London), Ltd.
H22	Robert Maclean & Co., Ltd.		Electrical Division of Radiation, Ltd.
N		N1	A. H. Hunt (Capacitors), Ltd.
N2	Allan West & Co., Ltd.	N2	Dahl Brothers, Ltd.
N3		N3	Micanite & Insulators Co., Ltd.
N4 & N5	Brookhurst Igranite, Ltd.	N4	Fawcett Preston & Co., Ltd.
N6	South Wales Switchgear, Ltd.	N5	English Electric Co., Ltd. (Domestic Appliance Division)
N7	Terra Engineering Co., Ltd.	N6	English Electric Co., Ltd. (Domestic Appliance Division)
N8	Thermaloy, Ltd.	N7	Julius Sax & Co., Ltd.
N9	J. P. Filhol, Ltd.	N8	Bayliss, Jones & Bayliss, Ltd.
N10	Klaxon, Ltd.	N9	Aircraft Engineering Products (Gt. Britain), Ltd.
T		T1	Aeroflot Manufacturing Co., Ltd.
T2	Catylators, Ltd.	T2	Alfred Imhof, Ltd.
T3	Harmer & Simmons, Ltd.	T3	Connollys (Blackley), Ltd.
T4	Micanite & Insulators Co., Ltd.	T4	Mullard, Ltd.
T5	Fawcett Preston & Co., Ltd.	T5	Albright (Engineers), Ltd.
T5	English Electric Co., Ltd. (Domestic Appliance Division)	T6	Pye, Ltd.
T5	Bowthorpe Electric Co., Ltd.	T7	Communications Feature
O		O1	Laurence, Scott & Electromotors, Ltd.
O2	Metway Electrical Industries, Ltd.	O2	Vanguard Engineering Co.
O3	Beckett & Parker, Ltd.	O3	Engelhard Hanovia Lamps
O4		O4	Tiroler Controls, Ltd.
O5	Electrical Trades Union	O5	C.M.P. Glands, Ltd.
O6	City and Guilds of London Institute	O6	Imperial Chemical Industries, Ltd. (Metals, Nobel and Plastics Divisions)
O7 & O8	Institution of Electrical Engineers	O7	Dale Electric (Yorkshire), Ltd.
O9	Association of Supervising Electrical Engineers	O8	
O10	Electrical Industries Benevolent Association	O9	
O11	Crawley College of Further Education	O10	
O12	Borough Polytechnic		
O13	Northern Polytechnic		
O14	Wimbledon Technical College		
O15	Territorial Army (65th Signal Regiment)		
O16	The Admiralty		
O17	Faraday House Electrical Engineering College		
P		P4	Royal Worcester Industrial Ceramics, Ltd.
P5	Carr Fastener Co., Ltd.	P5	Batwin Electric Motors, Ltd.
P6	London Fan & Motor Co., Ltd.	P6	Sofono Electrical Division of Federated Foundries, Ltd.
P7		P7	Pole, Ltd.
P8		P8	Domestic Electrical Appliances
P9		P9	General Electric Co., Ltd.
P10		P10	Sterling Cable Co.
P11		P11	Wallacetown Engineering Co., Ltd.
P12		P12	Streatite & Porcelain Products, Ltd.
P13		P13	Vent-Axis, Ltd.
P14		P14	Telemeter, Ltd.
P15		P15	Firth Cleveland Instruments, Ltd.
P16		P16	Simmonds Aerocessories, Ltd.
P17		P17	Dr. Beck & Co. (England), Ltd.
P18		P18	Grubb Engineering Co., Ltd.
P19		P19	
P20		P20	
V		V1	Bruce Peebles & Co., Ltd.
V2	General Electric Co., Ltd.	V2	General Electric Co., Ltd.
V3	Scotting Cable Co.	V3	Scotting Cable Co.
V4	Wallacetown Engineering Co., Ltd.	V4	Wallacetown Engineering Co., Ltd.
V5	Streatite & Porcelain Products, Ltd.	V5	Streatite & Porcelain Products, Ltd.
V6	Vent-Axis, Ltd.	V6	Vent-Axis, Ltd.
V7	Telemeter, Ltd.	V7	Telemeter, Ltd.
V8	Firth Cleveland Instruments, Ltd.	V8	Firth Cleveland Instruments, Ltd.
V9	Simmonds Aerocessories, Ltd.	V9	Simmonds Aerocessories, Ltd.
V10	Dr. Beck & Co. (England), Ltd.	V10	Dr. Beck & Co. (England), Ltd.
W		W2	Mawdsley's, Ltd.
W3	Ross, Courtney & Co., Ltd.	W3	Eswa, Ltd.
W4	W. Mackie & Co., Ltd.	W4	W. Mackie & Co., Ltd.
W5	Midland Bank, Ltd.	W5	Midland Bank, Ltd.
W6	Loco, Ltd.	W6	Loco, Ltd.
W7	Universal Installations Co., Ltd.	W7	Universal Installations Co., Ltd.
W8	W. Lucy & Co., Ltd.	W8	W. Lucy & Co., Ltd.
W9	Newton Brothers (Derby), Ltd.	W9</	



**A.E.I. Lamp & Lighting Co., Ltd.**, "Amberline" sodium floodlight for use with the Mazda 200 W linear sodium lamp

433 V dry-type class C insulated transformer and medium-voltage switchgear. The switchgear comprises a type AIR air-break withdrawable circuit-breaker incorporating integral earthing and hinged for easy maintenance and type CMC fuse switch units to control the outgoing circuits. A new addition to the "Q" range of switchgear is being shown. This comprises an 11 kV air-insulated vertically-isolated switch unit with integral earthing. The current and voltage transformers are insulated with epoxy resin and the single-break oil circuit-breaker has bolted type epoxy resin bushings and is designed for ratings up to 250 MVA at 6.6 kV and 350 MVA at 11 kV.

*Associated Electrical Industries (Manchester), Ltd. (Switchgear Division), Trafford Park, Manchester, 17.*

#### **A.E.I. (MANCHESTER) (TRANSFORMER DIV.) (GII)**

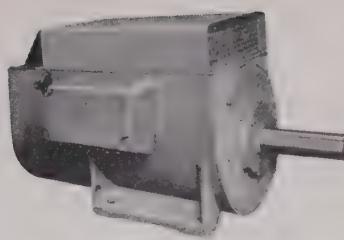
Transformers and heating equipment. A 300 kVA flameproof dry-type class C insulated underground mining transformer is shown combined with a flameproof circuit-breaker incorporating internal isolation. The 750 kVA dry-type class C insulated hermetically-sealed nitrogen-filled transformer shown has been produced for use under hazardous conditions. A 17-position 33 kV 200 A high-speed resistor-transition on-load tap changer shown has a motor-driving mechanism and push-button control. It is suitable for use on transformers up to 12.5 MVA. A light and compact oil testing set is also shown.

In the heating section of this display, new control boxes complete with isolator and fuses for industrial process infra-red heating are shown. An improved design of the standard A.E.I. infra-red oven is exhibited. Other products are the "Redring" radiant plates and "Slimline" radiant heaters.

*Associated Electrical Industries (Manchester), Ltd. (Transformer Division), Trafford Park, Manchester, 17.*

#### **A.E.I. (RUGBY) (K14)**

Products of the Motor and Control Gear, Electronic Apparatus, and Heavy Plant Divisions of Associated Electrical Industries, Ltd., are shown on



Type NC squirrel-cage induction motor with Class "E" insulation  
(A.E.I. (Rugby), Ltd.)



AC-Delco Division of General Motors, Ltd., capacitor start motor for refrigeration duty

this stand. The Motor and Control Gear Division are demonstrating the totally-enclosed machines with Class E insulation and 65°C temperature rise in accordance with B.S. 2613 : 1957 in ratings from  $\frac{1}{2}$  to 200 h.p. A newly developed totally-enclosed machine, type NC, with closed-air and circuit-air enclosure, is representative of a line of medium sized motors up to 200 h.p. The control gear shown includes a "Logicon" static switching unit, a multi-motor control unit, small standard type control gear and limit switches. The Electronic Apparatus Division are showing "Emotrol" electronic motor control equipment, control equipment for resistance welding machines, and industrial communication equipment for the mining industry. A display of industrial valves include thyratrons of both mercury and mixed gas types and xenon rectifiers. Spark gaps for protection of capacitors on overhead lines are also featured. A full-sized sectioned mercury-arc rectifier tank for mine winder and rolling mill drives is exhibited by the Heavy Plant Division.

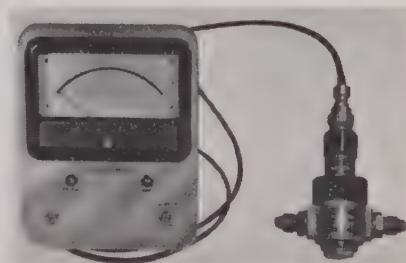
*Associated Electrical Industries (Rugby), Ltd., Rugby.*

#### **A.E.I. (WOOLWICH) (F9)**

All types and voltages of cables, radio and electronic components and telecommunication equipment. The Cable Division are featuring a section of the 200 V d.c. submarine cable which will be used to couple the French and British electricity supply system. Other cables displayed include solid, oil-filled and gas cushion super-tension types; railway electrification, colliery and ship types, and l.v. types such as plastic mains and Solidal cables. Dis-



Aerialite "Rota-Rinse" spin and rinse dryer



High pressure flowmeter by Armstrong Whitworth Equipment

tribution equipment shown includes joint boxes, services fuses, cartridge fuse-links, connector and terminal boxes, glands, and distribution panels and pillars. Wiring accessories comprise cooker control units, switches, sockets and plugs. The Cables and Lines Construction Division are showing 25 kV railway electrification cable.

A cordless switchboard for private automatic branch telephone exchanges is shown by the Telecommunications Division together with a compact 10-line private automatic exchange. Telephones shown include the "Centenary Neophone," which employs printed circuitry, the new G.P.O. type 706 telephone and telephones for special uses such as deaf-aid instruments. The "Herald-a-Phone" internal paging and telephone system are among the other products shown which also include staff control and time-keeping equipment, public address equipment and fire alarm units.

*Associated Electrical Industries (Woolwich), Ltd., 33, Grosvenor Place, London, S.W.1.*

#### **AERIALITE (K11)**

Rubber and plastic cables and accessories up to 3.3 kV and domestic laundry equipment. Armoured power cables up to 0.3 sq in are shown and the complete jointing procedure for

plastic insulated power cables using the Aerialite resin filled cable joint and jointing kit are being demonstrated. A new range of television relay cables and accessories is also demonstrated and heating cables for floor, ceiling and road heating are shown as well as rubber and plastic cables for domestic and industrial use. Drying cabinets and a spinner-rinse dryer are displayed by the Domestic Appliance Division.

*Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.*

#### AGRO ELECTRICAL (C3)

Domestic and industrial electric bells, bell pushes, bell transformers and wiring accessories.

*The Agro Electrical Co., Ltd., National House, 60-66, Wardour Street, London, W.1.*

#### AIRCRAFT-MARINE PRODUCTS (Z10)

Solderless wiring devices.

*Aircraft-Marine Products (Gt. Britain), Ltd., 87-89, Saffron Hill, London, E.C.1.*

#### ALBRIGHT (ENGINEERS) (Z15)

Solenoid switches and contactors; l.v. and h.v. switches and switch panels; resistors; and commutators and slippings.

*Albright (Engineers), Ltd., 125, Red Lion Road, Tolworth, Surbiton, Surrey.*

#### ALCAN INDUSTRIES (S12)

Aluminium cables, busbars and other components in aluminium. This company (formerly the Northern Aluminium Co., Ltd.) is featuring a display of "Solidal" plastic-insulated aluminium cables together with a demonstration of jointing by soldering and compression. Another display represents four typical applications of aluminium busbars, rectangular, channel, tubular and plug-in types. Transformer coils wound in aluminium foil are exhibited and other products shown include the "Noralgrip" range of accessories for transmission and distribution lines. The "Noraduct" roll-welded sheet incorporating integral tubes and cells shown is applicable to transformer heat exchangers.

*Alcan Industries, Ltd., Banbury, Oxfordshire.*

#### ALLEN WEST (N2)

Motor starters and control equipment. Hand operated and automatic multi-starter switchboards are shown. Control accessories and special purpose switches, including push buttons of all types, limit switches and float operated liquid level controls are also displayed as well as motor starters and control equipment in a wide range of designs for industrial and flameproof installation. Other products shown include unit type a.c. contactors of 15 A, 30 A and 50 A sizes. A new product shown is the "Unitactor" multi-starter contactor board.

*Allen West & Co., Ltd., Brighton, 7.*

#### ALLIED INSULATORS (U5)

Porcelain insulators and fittings manufactured by Taylor Tunnicliff & Co., Ltd., Bullers, Ltd., Electric & Ordnance Accessories Co., Ltd., and Taylor Tunnicliff (Retractories), Ltd. For details see under separate entries.

*Allied Insulators, Ltd., Milton, Stoke-on-Trent, Staffordshire.*

#### ALORITE, LTD. (H14)

Ceramic fuse bodies, insulating beads, and insulators.

*Alorite, Ltd., Salterbeck, Workington, Cumberland.*

#### ARMSTRONG WHITWORTH (W7)

Data handling equipment, electro-hydraulic valves, tacho-generators and flowmeters. A new digital data handling system designed for transmitting information by radio, telephone or telegraph channels, and recording received information in analogue or digital form is being shown. A new wafer-thin digit selector switch can be mounted edgewise for compactness. The switch has ten positions, the contact segments being etched copper foil, rhodium plated, or Bakelite laminate. Other items on show includes a miniature fluid flowmeter, an electro-hydraulic two-stage servo valve, an actuator jack and a limited angle tacho-generator.

*Armstrong Whitworth Equipment, Sir W. G. Armstrong Whitworth Aircraft, Ltd., Hucclecote, Gloucester.*

#### ARROW ELECTRIC (J12)

Motor control contactors, starters and relays, push buttons, selectors, isolator and rotary switches, and pilot lights. A new series of slow make and break rotary switches, available in either three, four, five or six positions, rated at 13 A 250 V a.c. are shown. A recent addition to the range of multi-circuit packet switches is in the form of a series of slow make and break a.c. switches rated at 10 and 30 A with up to 14 poles.

*Arrow Electric Switches, Ltd., Hanger Lane, Ealing, London, W.5.*

#### ASHBURTON RESISTANCE (R7)

A range of wirewound resistors comprising open wirewound, vitreous enamelled, rotary and precision. All "Arcol" precision resistors are supplied in six tolerance grades.

*The Ashburton Resistance Co., Ltd., 72, Brewery Road, London, N.7.*

#### ASHLEY ACCESSORIES (F5)

Wiring accessories including safety switch sockets. The 13 A ring main circuit accessories shown include the "Safety Switch" sockets, heavy duty type plugs and sockets and 13 A socket adaptors, fused and unfused. New products shown include the 13 A twin socket and "Pattrebox," and the "Polyblok" mounting block.

*Ashley Accessories, Ltd., Ulverston, Lancashire.*

#### A.S.E.E. (O9)

Brochures concerning membership of the Association of Supervising Electrical Engineers are available on this stand. Publications concerning the activities of the Association and other literature are also available.

*Association of Supervising Electrical Engineers, 23, Bloomsbury Square, London, W.C.1.*

#### ASTRAL SWITCHGEAR (F5)

Fused switches, heavy adaptable boxes, steel enclosures, busbar trunking, multi-way terminal assemblies.

*Astral Switchgear, Ltd., Ulverston, Lancashire.*

#### ATLAS LIGHTING (J16)

Filament and fluorescent lamps and lighting fittings. A new range of fluorescent fittings for 4ft, 5ft and 8ft single and twin tube installations is featured on this stand together with a demonstration of a new and efficient tube. Atlas De-Luxe tubes can be seen and compared in an automatic colour comparator unit. The Atlas "A-Plan" fittings are also on show together with a new range of decorative tungsten fittings including pendants, wall brackets and table stands. New "Wafer" fittings are displayed alongside the "Superslim" Popular Packs and the "Chelsea" Kitchenlite.

*Atlas Lighting, Ltd., Thorn House, Upper St. Martin's Lane, London, W.C.2.*

#### AUSTINLITE (Z1)

Rotary switches, relays and static invertors. New rotary switches on show include the range specially developed for Transfynydd nuclear power station. The lockable switch-handles are designed to be easily identifiable by touch alone. A rotary switch fitted with no-volt release or star-delta release and a rotary switch to carry 800/1,500 A are other new items on show. A new marginal relay for current, voltage and frequency sensing and a static inverter equipment for "No-Break" power supplies are among the other new items.

*Austinlite, Ltd., Schomberg House, 82, Pall Mall, London, S.W.1.*

#### AUSTIN MOTOR CO. (QII)

Gas turbines. The 250 b.h.p. gas turbine shown has been specifically designed for industrial use. It has a single shaft turbine rotor running at a speed of 29,000 r.p.m. and is fitted with a reduction gear box reducing the output shaft speed to 1,500 r.p.m.

*The Austin Motor Co., Ltd., Longbridge, Birmingham.*

#### B. & R. RELAYS (Z6)

Relays and associated control gear for light current and power circuit switching. New products on show this year include the type "QO" relay contactor for machine tool control and allied functions, the type "B.14" single pole change-over relay, vacuum switch relays for heavy loads and for generating high transient voltages, a

series of plug-in relays and a transistorised timer unit.

*B. & R. Relays, Ltd., Temple Fields, Harlow, Essex.*

#### BACKER ELECTRIC (C2)

Industrial and commercial tubular sheathed heating elements. Railcar seat, corridor and hot water system heaters are shown with traction resistors on a representation of a railway carriage and platform.

*The Backer Electric Co., Ltd., Fitzwilliam Road, Rotherham, Yorkshire.*

#### BAKELITE (K8)

Laminated materials, moulding materials, resins and extrusion materials. There are also printed circuits based on copper clad Bakelite laminates. In addition to varnishes, surface coatings and adhesives, there is a selection of cables with polyethylene insulation including some incorporating cellular polyethylene which is suitable for high frequency cables.

*Bakelite, Limited, 12-18, Grosvenor Gardens, London, S.W.1.*

#### H. J. BALDWIN (J20)

Cable protection covers, stoneware conduits and joint boxes, heating elements, plastic covered wire and cable, electric blankets and plastic extrusions. A representative selection of clay and concrete self-locking cable protection covers, stoneware conduits, joint boxes, precast concrete stay blocks, etc., are shown in addition to "Wireohms" electric heating elements in mica and ceramic and "Duratube" plastic covered wires and cables.

*H. J. Baldwin & Co., Ltd., 132, Arkwright Street, Nottingham.*

#### BATWIN ELECTRIC MOTORS (P7)

*See London Fan & Motor Co., Ltd.  
Batwin Electric Motors, Ltd., 331, Sandycombe Road, Richmond, Surrey.*

#### BAYLISS, JONES & BAYLISS (Z9)

Transmission line steelwork for h.v. and l.v. lines and telecommunications.

*Bayliss, Jones & Bayliss, Ltd., G.K.N. House, 22, Kingsway, London W.C.2.*

#### DR. BECK & CO. (V9)

Resinous materials for electrical insulation. A range of insulating enamels for round wire and strip conductors are displayed together with impregnating insulating varnishes, and "Dobekot" epoxy and "Dobekan" polyester casting resins.

*Dr. Beck & Co. (England), Ltd., Hayes Lane, Slinfold, Nr. Horsham, Sussex.*

#### BECKETT & PARKER (N13)

Switchboard, controller and flameproof ammeters and voltmeters, including relay operating types, and ring type current transformers.

*Beckett & Parker, Ltd., 157-159, Summer Lane, Birmingham, 19.*

#### BELMOS (C4)

Medium-voltage motor control gear for industrial and flameproof applications. Representative of the industrial products are multi-tier control boards with throughgoing busbars at the top of the board and examples of outgoing ways at either the top or the bottom.

*The Belmos Co., Ltd., Bellshill, Lanarkshire.*

#### BENJAMIN ELECTRIC (L9)

Lighting fittings for fluorescent tubes, tungsten lamps, fluorescent bulb lamps and mercury lamps. Introduced at the exhibition is a new range of "Coolicon" shades, additional models to the "Litemaster" range of fluorescent lighting fittings and a new "Sky-Line" fluorescent lighting fitting. Also shown are "Taskmaster" trunking, and "Model Fifty" reflectors for tungsten lamps.

*The Benjamin Electric, Ltd., Brantwood Road, Tottenham, London, N.17.*

#### BERTRAM THOMAS (C7)

Medium voltage and industrial switchgear. Among the items shown on this stand is a high speed truck type circuit-breaker, a five panel 415 V three-phase 50 c/s 31 MVA totally enclosed air break switchboard with a withdrawable circuit-breaker, a 13-panel totally enclosed withdrawable circuit-breaker air break d.c. switchboard for controlling the output of a semiconductor rectifier, and heavy current d.c. air break circuit-breakers.

*Bertram Thomas (Engineers), Ltd., Worsley Street, Hulme, Manchester, 15.*

#### BILL SWITCHGEAR (L8)

Medium voltage air-break switch and fuse gear. Exhibits include "Majestic" fuseboards and cubicle switchboards, "Crown" switchgear for a.c. circuits and various units from the standard ranges of "Bill" switch-fuse distribution gear and accessories. Also on view is a new range of 500 V fuseboards to B.S. 214:1959.

*Bill Switchgear, Ltd., Aston Lane, Perry Barr, Birmingham, 20.*

#### B.K.B. ELECTRIC MOTORS (H19)

Motors, generators and a double reduction gear box. The exhibits on this stand include single-phase motors from  $\frac{1}{2}$  to 3 h.p., three-phase motors from  $\frac{1}{2}$  to  $7\frac{1}{2}$  h.p., d.c. motors from  $\frac{1}{2}$  to 25 h.p., a.c. and d.c. generators up to 30 kW, frequency changers, motor-generator sets, rotary converters, and welding generators. Also on view are 400 c/s generators and units for marine applications. New this year is a range of "Regohm" automatic voltage regulators.

*B.K.B. Electric Motors, Ltd., Saint George's Works, 132, Icknield Street, Birmingham, 18.*

#### BLACKBURN ELECTRONICS (W7)

Digital voltmeters and recorders, data amplifiers and other electronic equipment. The digital voltmeters

shown provide decimal precision, automatic range change and sign selection, being designed for applications requiring accurate measurement down to 0.01 per cent of d.c. voltages. These include computer inputs and outputs, reference supply and strain gauge measurements and production testing of electronic and electrical components. The digital recorder comprises a 50-point double pole scanning switch, a four-digit voltmeter and a high speed strip printer. It scans four inputs per second and records their value, polarity and identification. Other products shown include a Hall effect multiplier and a transistorised data amplifier.

*Blackburn Electronics, Ltd., Brough, Yorkshire.*

#### F. C. BLACKWELL (K5)

Conduit fittings in pressed steel and pressure die-cast in iron and zinc alloy. Exhibits include switch and socket boxes up to 13 A rating. Junction and switch boxes for m.i.c.c. cable are available with a finish matching that of the cable. New this year is "Blacon" rigid p.v.c. tube, conduit and fittings, and switch boxes and an all-insulated rewirable system.

*F. C. Blackwell & Co., Ltd., Great Crosby, Liverpool, 23.*

#### THOMAS BOLTON (C8)

Copper and copper-base alloy wire, bar, rod, sheet, strip and foil, busbars, sections, commutator bars and segments, and tubes. Exhibits include drawn finish busbars up to 3in square or 10in wide by 1in thick and hard-rolled busbars up to 12in by  $\frac{1}{2}$ in by 16ft long. Cellular conductors for e.h.v. busbars and connections, supplied on drums, are on show, together with tubular and laminated busbars. Components for rotary machines include commutator bars and segments and hollow copper conductors for rotor and stator windings. These conductors are made from high conductivity "Combarloy" and other silver-bearing copper.

*Thomas Bolton & Sons, Ltd., Mersey Copper Works, Widnes, Lancashire.*

#### BONAR, LONG (S11)

Outdoor distribution pillars, indoor substation distribution boards, industrial board metalclad fuse switch, flameproof capacitors and dwarf distribution and street lighting pillars. New products include distribution transformer cabinets for 200 and 500 kVA transformers, including maximum demand indicators and current transformers; and flameproof mining type transformers rated up to 300 kVA at 6.6 kV and designed to accommodate h.v. and l.v. flameproof switchgear or any arrangement of cable termination.

*Bonar, Long & Co., Ltd., East Kingsway Works, Dundee, Angus.*

#### D. H. BONNELLA (R12)

Miniature moulded body switches rated from 1 to 3 A at 230 V a.c. or d.c. are

shown with toggle, slide, or push-button action. Also featured are switches with moulded dolly levers and the 1-10 A switch range with a wide variety of top actuating mechanisms.

*D. H. Bonnella & Son, Ltd., West Hill, Hoddesdon, Hertfordshire.*

#### BOROUGH POLYTECHNIC (O12)

Signal controlled model train and experiments and demonstrations illustrating the principles involved in its operation and control.

*Borough Polytechnic, Borough Road, London, S.E.1.*

#### F. H. BOURNER (FIXINGS) (L15)

Tools for making fixings to steel, brickwork and concrete. The "Spitmatic" cartridge operated tool enables up to 120 fixings per hour to be made with pins of  $\frac{1}{4}$ in and  $\frac{1}{8}$ in diameter. The "Supadynamic" tool makes fixings from  $\frac{1}{8}$ in up to  $\frac{1}{2}$ in diameter. New this year is the "Bulldog Gold Digger" drill/anchor which drills holes for and expands hardened steel plugs which range in size from  $\frac{1}{4}$ in to  $\frac{3}{8}$ in internal diameter.

*F. H. Bourner (Fixings), Ltd., Manor Royal, Crawley, Sussex.*

#### BOWTHORPE ELECTRIC (T5)

Fittings and tools for overhead line construction. These include line accessories, earthing equipment, compressors, and jointing equipment. A demonstration of jointing underground cable is given and the applications of compression jointing in the mining industry are exhibited.

*The Bowthorpe Electric Co., Ltd., Crawley, Sussex.*

#### E. N. BRAY (Y7)

Contactors, relays and cam timers. On view are d.c. operated contactors for controlling heating loads and emergency lighting changeover contactors complying with B.S. 764, also a panel with small relays, cam timers, a high speed contactor controlling a Morse signalling lamp and a logic switching panel. Heavy duty 300 and 600 A contactors are shown in various arrangements of interlocked pairs and combined with overload relays. Also on view are new 15 and 25 A block type contactors, a moulded overload relay with interchangeable heaters, ambient temperature compensation and single phasing protection; and new industrial and marine a.c. starters.

*E. N. Bray, Ltd., Britannia Road, Waltham Cross, Herts.*

#### GEO. BRAY (J2)

Ceramic embedded resistance heaters. These heating elements are available in strip, ring, cartridge and tubular form. Also on view are small ceramic pieces mass produced by auto-die pressing and extrusion techniques.

*Geo. Bray & Co., Ltd., Leicester Place, Blackman Lane, Leeds, 2, Yorks.*

#### S. N. BRIDGES (X10)

Portable electric tools and domestic appliances. The "Morepower" industrial range includes drill guns from  $\frac{1}{4}$ in to 1 $\frac{1}{4}$ in capacity while the home workshop equipment shown is powered by the  $\frac{1}{4}$ in and  $\frac{1}{2}$ in "Neonic" drills. The new  $\frac{1}{2}$ in de-luxe "Neonic" drill has an automatic overload cutout. Also new are a fan heater, a food mixer, electric blankets, table top cooking units and a hair dryer.

*S. N. Bridges & Co., Ltd., York Road, Battersea, London, S.W.11.*

#### BRITISH ELECTRIC RESISTANCE CO. (M2)

Resistances, rheostats, potentiometers, rotary power rheostats, speed controllers, voltage regulators and stabilisers. "Berco" resistances from 25 to 1,000 W are displayed. Speed controller units from  $\frac{1}{8}$  to 2 h.p. for d.c. shunt wound motors and rotary "Regavolts" are represented. New products shown include a heavy duty voltage regulator and two rack mounted voltage stabilisers of 10 and 30 A for holding the mains voltage constant to within  $\pm 1$  per cent.

*The British Electric Resistance Co., Ltd., Queensway, Enfield, Middlesex.*

#### BRITISH ELECTRICAL REPAIRS (F12)

Electrical, mechanical and general engineering repair, rewind design and installation work. Various appliances used by the company are shown, including metal spraying equipment, oxy-acetylene and electrical welding, transformer soldering and brazing. The use of portable dynamic balancing apparatus is demonstrated.

*British Electrical Repairs, Ltd., 10, Charlotte Street, Manchester, 1.*

#### B.I.C.C. (F10)

Power and telecommunication cables and heating cables, overhead line equipment and accessories. Paper insulated cables, in particular corrugated seamless aluminium sheathed types, plastic power cables, p.t.f.e. cables and wires, mineral-insulated cables, Panelec floor warming cables, busbars, and wiring accessories are on display. New products shown include a cubicle type capacitor. Also shown for the first time are the B.I.C.C.-Panelec horticultural heating cables designed for burying direct in propagating beds. B.I.C.C.-Burndy solderless electrical connectors can also be seen on this stand.

*British Insulated Callender's Cables, Ltd., P.O. Box No. 5, 21, Bloomsbury Street, London, W.C.1.*

#### BRITISH KLOCKNER SWITCHGEAR (H14)

Motor control gear. Automatic control panels made for motors up to 15 h.p. direct-on-line or 25 h.p. auto stator-rotor starting, also for lift controllers suitable for motor starting direct-on-line up to 2 h.p. on 380/440 V three-phase or  $\frac{1}{2}$  h.p. on 200/250 V

single-phase are shown. Starters, contactors, thermal overload units, push-button and remote control stations, limit switches and rotary switches are also displayed.

*British Klockner Switchgear, Ltd., Chertsey, Surrey.*

#### BRITISH POWER TRANSFORMER CO. (M2)

*See British Electric Resistance Co.*

*The British Power Transformer Co., Ltd., Queensway, Enfield, Middlesex.*

#### BRITISH RESISTOR CO. (M8)

Heating elements. "Delta Globar" silicon carbide elements are shown in a range of heating lengths from 2in to 72in with elements from  $\frac{1}{4}$ in to 2 $\frac{1}{2}$ in dia.

*The British Resistor Co., Ltd., Trafford Park, Manchester, 17.*

#### BRITISH STANDARDS INSTITUTION (O3)

British Standards for electrical equipment are displayed. The B.S.I. kite-mark and an approvals service for exporters of electrical goods to Canada are described.

*The British Standards Institution, 2, Park Street, London, W.1.*

#### BROOK MOTORS (M12)

Electric motors and control gear. Shown is a selection of standardised industrial motors in drip proof ventilated and totally enclosed fan cooled arrangements. Epoxy encapsulation, which can be applied to the windings of drip proof motors, is demonstrated. F.h.p. motors, contactors, push-button stations, and electronic timers are also shown.

*Brook Motors, Ltd., Empress Works, Huddersfield.*

#### BROOKHIRST IGRANIC (N4)

Motor control gear and switches. The "Bi-stat" static switching system is featured, also new proximity limit switches suitable for use in both static and conventional schemes, rubber gasketed across-the-line starters, a re-designed type 303 heavy duty, multi-cell rotary switch for a maximum of 60 A on-load multi-circuit switching, and an a.c. spring-operated disc brake.

*Brookhirst Igranic, Ltd., Elstow Road, Bedford.*

#### BROWNING'S ELECTRIC (F8)

Variable speed induction motors, f.h.p. motors and induction regulators, actuators, commutators and slip rings. The latest "straight line" type mini-actuator giving 300 lb/thrust in either direction on a three-phase supply, is being demonstrated. A reduction geared squirrel cage motor with variable speed and constant torque characteristics for a 400 V three-phase supply is also shown.

*The Browning's Electric Co., Ltd., Boleyn Castle, Green Street, London, E.13.*

**BRUCE PEEBLES (VI)**

Rotating machines, power generators, transformers and electronic equipment. A full-scale replica model of a 10ft diameter rotor showing the detailed construction of the actual rotors for the 12 MW generators supplied by this company for the Shin scheme of the North of Scotland Hydro-Electric Board forms the central feature of this stand. A scale model of a complete 24 MW power station illustrates the company's activities in the field of hydro-electric work. Industrial motors for general applications are shown, also a 400 kVA transformer constructed with a boltless mitred core and a low loss rural transformer built with a closed loop core. A 300 kVA flame-proof dry type mobile transformer is shown for the first time. Demonstrations on an electrolytic analogue to determine the initial distribution of an impulse or surge voltage applied to a transformer winding are being given.

*Bruce Peebles & Co., Ltd., Edinburgh, 5.*

**BRUNT VARIABLE SPEED MOTORS (X17)**

Rotating machines and test equipment. The products shown include the "Octopus" range of electrical test equipment and the new variable speed motors for industrial applications. The 25 h.p., 3,000-0-3,000 r.p.m. variable speed motor is complete with electronic control providing constant speed under varying load conditions.

*Brunt Variable Speed Motors, Ltd., Burnley Street, Chadderton, Oldham.*

**BRUSH (C6)**

Motors and generators, turbines, transformers, switchgear and traction equipment. The rotating machines shown include two statically excited

self-regulated alternators with built-in control gear, ventilated motors and a selection of slip ring induction motors. There is a demonstration on this stand showing the speed control of a 30 h.p. motor by means of switch silicon rectifiers. A 300 kVA dry type air-cooled flameproof transformer with a voltage ratio of 3,300/565 and a 33 kV resistor type high-speed on-load tap changer and a 500 kVA oil-cooled distribution transformer are shown, also one 400 A 500 MVA 11 kV type VBC metalclad, vertical-isolation, horizontal-drawout circuit-breaker unit. A 400 A 250 MVA 11 kV type VBA air-insulated circuit-breaker unit, a 90 A 11 kV type HF/OJJ ring main unit, and a range of h.b.c. fuselinks are also shown.

*The Brush Electrical Engineering Co., Ltd., Loughborough, Leics.*

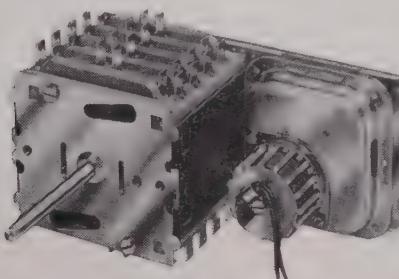
**BRYCE ELECTRIC (M9)**

Transformers and capacitors. The exhibits on show include a 750 kVA 11,000/433 V class C insulated transformer and a 1,500 kVA 11,000/433 V oil-immersed transformer removed from its tank. Power factor correction capacitors shown include a 100 kVar 451 V cubicle type capacitor having multi-stage p.f. relay and contactor panel, and a 45 kVar 550 V mining type capacitor. Other products shown include a power factor tester and a 500 kVA 11,000/423 V oil immersed distribution transformer having h.v. and l.v. windings made from aluminium foil.

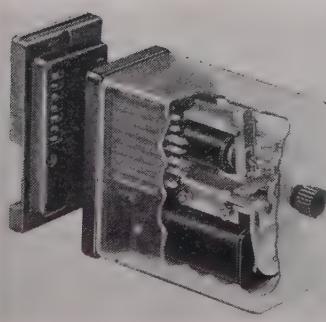
*The Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey.*

**BULLERS (U5)**

Porcelain insulators and bushings. Porcelain insulators for all voltages including 275 kV are shown. These



Series "S" cam timer (Chamberlain & Hookham)



Clifford & Snell type D.2600/T transistorised relay

insulators are suitable for transmission lines, railway electrification and telegraph and telephone communications. Other products shown include bushings and ceramics for the radio and electronic industries and for electrical accessories and appliances.

*Bullers, Ltd., Milton, Stoke-on-Trent, Staffordshire.*

**BULPITT & SONS (H19)**

Domestic and industrial appliances. Domestic appliances shown include "Swan Brand" kettles, coffee percolators, toasters, urns, blankets, and immersion heaters. New products shown include "Swan Brand" "Cygnets" blankets, a kettle in polished aluminium and twin saucepans. Other products include immersion elements for industrial appliances.

*Bulpitt & Sons, Ltd., St. George's Works, 132, Icknield Street, Birmingham, 18.*

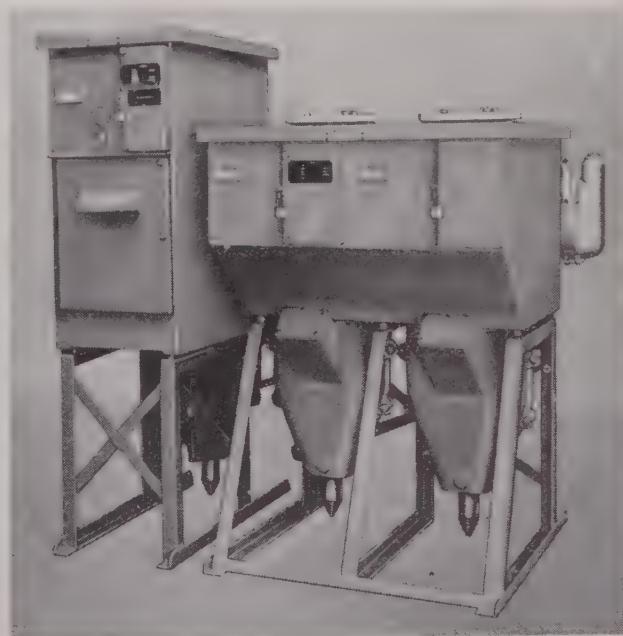
**BURGESS PRODUCTS (DII)**

Micro-switches. A range of micro-switches meeting the requirements of domestic appliance manufacturers is displayed. A new product shown is the high-capacity double-break switch rated at 25 A.

*The Burgess Products Co., Ltd. (Micro Switch Division), Dukes Way, Team Valley, Gateshead, 11, Co. Durham.*

**CABLE COVERS (U10)**

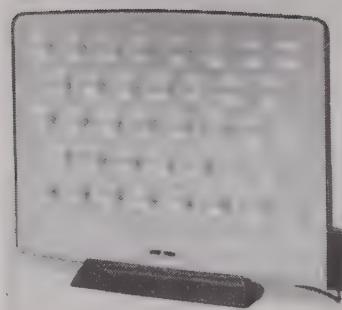
Overhead line equipment, earth clamps, meter boards, cable lugs and cable rollers. A new method of compression jointing using a cartridge firing gun is displayed and an overhead line assembly has been erected to demonstrate the range of overhead line equipment. On show are earth clamps,



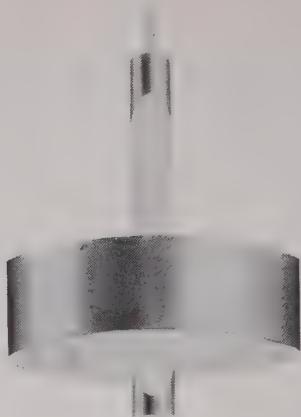
Brush type HF/OJJ high voltage extensible ring main unit



Cooke & Ferguson triple-pole 33 kV type OEI oil circuit-breaker shown by Crompton Parkinson, Ltd.



Crompton Parkinson "Commodore" fluid-filled electric radiator



Circular fluorescent fitting shown by Courtney, Pope (Electrical), Ltd.



Contactum surface type twin 13 A switched socket outlet

meter boards and a cable lug for industrial and substation installations.

*Cable Covers, Ltd., St. Stephen's House, Westminster, London, S.W.1.*

#### CARR FASTENER (P6)

Switches, indicator and warning lights and terminal strips. Exhibits include three- and five-way single- and double-pole push-button switches for domestic equipment. These have a common "off" button and are rated at 8 A, 250 V a.c., the circuits being made through silver contacts. Also on view are snap-in on-off switches suitable for duties up to 5 A 250 V a.c., and low voltage panel indicator and warning lights incorporating 12 V 1.2 W and 2.2 W bulbs.

*The Carr Fastener Co., Ltd., Stapleford, Nottingham.*

#### CARTER ELECTRICAL (S3)

Fractional horse power motors for domestic equipment, fans, film projectors, pump motors, small portable tool motors and geared motor units.

*The Carter Electrical Co., Ltd., Sew-Tric House, Honeypot Lane, Stanmore, Middlesex.*

#### WILLIAM E. CARY (K6)

See W. G. Walker & Co. (Engrs.), Ltd.

*William E. Cary, Ltd., Red Bank, Manchester, 4.*

#### CATYLATORS (T1)

Hydrogen destroying and water forming catalytic devices. These can comprise the control element for new methods of battery charging. The equipment is available in the form of add-on units for existing chargers as well as complete systems for traction charging and stand-by lighting sets.

*Catylators, Ltd., Weydown Road, Haslemere, Surrey.*

#### C.E.G.B. (B2)

The main feature on the Central Electricity Generating Board's stand is a model town used to illustrate how the demand on the electricity supply system fluctuates through each 24 hr. Displays also show how the C.E.G.B. is endeavouring to provide the increase in power required while minimising interference with the countryside's natural amenities.

*Central Electricity Generating Board, 7, Winsley Street, London, W.1.*

#### CHAMBERLAIN & HOOKHAM (Z4)

Meters, relays, instrument transformers and timers. The exhibits displayed include single- and three-phase meters and associated testing equipment, protective relays, instrument transformers, process timers and sequence cam timers for commercial and domestic washing machines, tumbler dryers and such apparatus as oil burning equipment. New products on show include a single disc polyphase meter with maximum demand indicator.

*Chamberlain & Hookham, Ltd., Solar Works, New Bartholomew Street, Birmingham, 5.*

#### CHILTON ELECTRIC (L10)

Contactors, starters, relays, circuit-breakers, switches and earthing rods in addition to shavers, hair clippers, torches and batteries. Products on show for the first time this year include a range of air-break contactors and motor starters rated from 15 to 100 A, power relays ranging from 6 to 10 A with various types of industrial enclosure, micro-switches from 6 to 10 A and a double-pole earth leakage circuit-breaker with a maximum current rating of 100 A.

*Chilton Electric Products, Ltd., Hungerford, Berkshire.*

#### CHLORIDE BATTERIES (K21)

A wide range of batteries for traction, switchgear operation, and emergency lighting. Among the Planté cells in glass and wood lead-lined boxes is a 1,000 Ah cell in a moulded glass box. High performance cells, self-contained automatic "Keepalite" emergency lighting equipment, switchgear operation equipment, cells for supervisory and control equipment and for railway signalling, and "Exide" dry batteries for electronic equipment are shown.

*Chloride Batteries, Ltd., Exide Works, Clifton Junction, Swinton, nr. Manchester.*

#### C. M. CHURCHOUSE (R5)

Domestic and commercial lighting fittings. The ranges of lighting fittings on show include exterior units for wall and canopy mounting, exterior lanterns for domestic use and recessed and flush mounted fittings with interchangeable reflectors. New products shown include three-, six- and twelve-way spreading fittings and a range of decorative pendants, ceiling fittings and wall brackets.

*C. M. Churchouse, Ltd., Clarendon Works, Clarendon Cross, London, W.11.*

#### CIBA (A.R.L.) (J24)

Applications of "Araldite" epoxy resin in the electrical industry. These include casting resins for manufacturing high voltage insulators and bushings, resins for impregnating and potting transformers of all sizes, and resins for glass cloth laminates, mouldings, protective coatings and adhesives.

*CIBA (A.R.L.), Ltd., Duxford, Cambridge.*

#### CITY AND GUILDS (O6)

Information on craft, technicians, operation and maintenance, and more advanced courses in electrical engineer-

ing and associated subjects offered by the Institute is displayed. Pamphlets containing regulations and syllabuses are on sale and a document entitled "City and Guilds and Electrical Engineering" is available free.

*City and Guilds of London Institute, 76, Portland Place, London, W.1.*

#### CLANG (J23)

Bakelite and porcelain electrical accessories. These include adaptors, ceiling roses, clock connectors, lamp-holders, plugs, sockets, and switches for domestic and industrial lighting.

*Clang, Ltd., Crown Yard, Cricklewood, London, N.W.2.*

#### CLARE INSTRUMENT (D2)

Electrical measuring equipment. Exhibits include flash testers incorporating facilities for insulation resistance measurement at 500 V d.c., automatic test stations, an a.c./d.c. Wheatstone bridge for checking iron cored windings for both resistance and impedance to detect shorted turns, and loop testers of the neutral/earth and phase/earth patterns.

*Clare Instrument Co., Clare Works, Ashacre Lane, Worthing, Sussex.*

#### H. CLARKE (X18)

Laminated plastic materials, paper base board, mica insulations and plastic cable trunking. The main exhibits this year are "Pirtoid" laminated plastic materials in sheet, rod and tube form, and paper base board and a range of copper clad materials suitable for printed circuits. Pure mica stampings, micanite vee rings, tubes, panels and machined components are exhibited together with plastic cable trunking.

*H. Clarke & Co. (Manchester), Ltd., Atlas Works, Patricroft, nr. Manchester.*

#### CLIFFORD & SNELL (Y3)

On view are plug-in relays, flashing and time delay units, latching relays, impulse relays, and relays equipped with magnetic blow-outs. Also displayed is a new transistorised relay, the type D.2600/T, which normally requires 0.02 A d.c. at 24 V.

*Clifford & Snell, Ltd., West Street, Sutton, Surrey.*

#### C.M.P. GLANDS (T12)

Cable glands for rubber insulated, lead covered, armoured and braided cables; for p.v.c. insulated, armoured and sheathed cables; and for paper insulated lead covered armoured and served cables. A water pressure tight seal and/or moisture proof seal to sheath over cores and sheath over armour is also available.

*C.M.P. Glands, Ltd., Glasshouse Street, St. Peter's, Newcastle-upon-Tyne, 6.*

#### E. K. COLE (F6)

Industrial and domestic heating equipment. The new industrial infra-

red heaters shown permit one-, two- or three-element/reflector assemblies to be used with a common spine. Either 1 or 1½ kW metal-sheathed elements are used, the maximum loading being 4½ kW. In the new inset convection heaters an Ekco 60 W "Fireglow" lamp is incorporated, also a double-pole on/off switch and an a.c. thermostat. Two sizes are available with a rating of 1½ kW and 2½ or alternatively 3 kW. Other heating appliances on view include a combined convector/radiant heater, portable and wall-mounting convector and radiant heaters, tubular heaters, a fan heater, high temperature panels, thermal storage heaters, thermostats and blankets.

*E. K. Cole, Ltd., Southend-on-Sea, Essex.*

#### CONNOLLYS (BLACKLEY) (Z13)

Insulated winding wires and strips, and "Reel Paks" covering the bulk packaging of the finer gauges of enamelled wires.

*Connollys (Blackley), Ltd., Kirkby Industrial Estate, Liverpool.*

#### CONTACTUM (G15)

Wiring accessories. New products shown include 13 A twin switched socket-outlets, surface and flush types, clock connectors and the "See-Saw" range of flush plaster depth switches. Other switched socket-outlets, socket-outlets, plugs, adaptors and junction boxes are also displayed.

*Contactum, Ltd., Victoria Works, Edgware Road, Cricklewood, London, N.W.2.*

#### CONTROLLED HEATING UNITS (J6)

Domestic and industrial heating elements and thermostats. Examples from the wide range of metal-sheathed mineral - embedded elements for domestic and industrial purposes are being shown, while new products exhibited include an immersion heater, a three-step thermostat and a pressure switch.

*Controlled Heating Units (London), Ltd., Avenue Road, Hampton, Middlesex.*

#### C.D.A. (LII)

The Copper Development Association (C.D.A.) are displaying copper conductors used for telecommunication, both on land and for undersea inter-continental services. The many copper alloys which are also used for innumerable special applications throughout the electrical industry are represented by a range of typical components.

*Copper Development Association, 55, South Audley Street, London, W.1.*

#### G. CORNER (Q3)

Solderless electrical terminations with associated crimping tools, jumper plugs and sockets. Sterilising ovens, a thermostatic bath and a laboratory flask

heater are also shown. New products include a domestic central heating unit and an electric fire.

*George Corner & Co., Ltd., Johnson Brook Road, Hyde, Cheshire.*

#### COURTNEY, POPE (M10)

Lighting fittings. The "Junior Brite-Glo" 6ft by 2ft floating ceiling illuminated by one 5ft fluorescent fitting over a suspended framework into which three translucent panels are dropped is displayed; other products on show include a range of coloured glassware fittings and many new tungsten and fluorescent lighting fittings.

*Courtney, Pope (Electrical), Ltd., Amhurst Park Works, Tottenham, London, N.15.*

#### J. A. CRABTREE (K10)

Wiring accessories, circuit-breakers and motor control gear. The ceiling switch for a.c. circuits shown is available in 5 A one- and two-way and 15 A double-pole ratings. Other products shown include 13 A twin switched socket-outlets with or without indicators and a range of switched and unswitched fused spur units. A control centre incorporating moulded case circuit-breakers of up to 800 A rating is shown and the type C-50 miniature circuit-breaker two- and three-phase distribution boards are shown for the first time. A new development is the type G relay suitable for currents up to 10 A and is available in two four-pole patterns; another is a compact pilot light unit embodying a small b.c. lampholder.

*J. A. Crabtree & Co., Ltd., Lincoln Road, Walsall, Staffordshire.*

#### CRAWLEY COLLEGE OF FURTHER EDUCATION (OII)

Details of the courses offered by the Electrical Engineering Department of this new college are available.

*Crawley College of Further Education, College Road, Crawley, Sussex.*

#### CRESSALL (K24)

Industrial resistors, heaters and control equipment. Shown on this stand are asbestos nets and grids, sliding rheostats and "Torostat" vitreous enamelled and open-wound toroidal rheostats. Also shown is the "Torovolt" variable transformer and an a.c. voltage stabiliser.

*The Cressall Mfg. Co., Ltd., Eclipse Works, Tower Street, Birmingham, 19.*

#### CRITCHLEY BROS. (R15)

Cable markers, terminal tags, cable fixings and terminal blocks.

*Critchley Bros., Ltd., Brimscombe, Stroud, Glos.*

#### CROMPTON PARKINSON (J15)

Rotating machines, switchgear, transformers, instruments, lamps, lighting fittings, and heating equipment. The "Commodore" fluid-filled 1 kW elec-

tric radiator is being shown for the first time. A range of a.c. induction motors from 1 to 10 h.p. and a representative selection of f.h.p. motors are shown together with one 125 h.p. t.e.f.c. squirrel-cage induction motor and two battery vehicle motors. A new flush-fronted oil circuit-breaker is suitable for ratings of 150 MVA at 3.3 kV, 250 MVA at 6.6 kV and 500 MVA at 11 kV. Another new circuit-breaker is rated at 500 MVA at 33 kV with 800 A maximum current. Other switchgear products shown include a two-tier 500 V switchboard type ABM and a range of epoxy resin moulded type current transformers for use on systems up to 11 kV. New tacho-generators are shown together with 2in and 2½in dial circular scale instruments. New designs of fluorescent lighting fittings up to 8ft long are also displayed on this stand.

*Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2.*

#### R. & A. G. CROSSLAND (M7)

Lighting reflectors and fittings for industrial and commercial applications, cable trunking and heating appliances. Fluorescent lamp reflectors for trunking systems, recessed fittings for module ceilings, sealed pattern non-corrosive fittings, new "Highlight" fluorescent fittings, floodlights and "Widalux" are featured.

*R. & A. G. Crossland, Ltd., 55, Ebury Street, London, S.W.1.*

#### DAHL BROTHERS (N3)

Cable fixing accessories. These include the A.P.K. clip and the "All-Round" band for fixing multiple cable runs, particularly suitable for mineral insulated cable since it is available in copper.

*Dahl Brothers, Ltd., 19-21, Morley Street, London, S.E.1.*

#### DALE ELECTRIC (T14)

Stationary, portable and mobile electric generating sets driven by diesel or petrol engines and generating at standard a.c. voltages. Also on this stand is the "Roll-a-Drum" device for unreeling cable.

*Dale Electric (Yorkshire), Ltd., Electricity Buildings, Filey, Yorkshire.*

#### DAVIS SHEET METAL (G4)

Cable and busbar trunking. Sections from the company's range of cable trunking are on view, including the flush and surface type standard sections, underfloor and flush floor and skirting sections. Other exhibits include busbar chambers, busbar trunking, link boxes, cable tap and busbar tap trunking. There are demonstrations of the "Quick Punch" for making holes in trunking *in situ*.

*Davis Sheet Metal Engineering Co., Ltd., Eley's Estate, Angel Road, Edmonton, London, N.18.*

#### DELTA TECHNICAL SERVICES (L1)

Pressure, vacuum, flow and temperature switches. Two of the instruments on view, covering a pressure range from fractions of an inch water gauge up to 20 tons/sq in, are being exhibited for the first time. A five-step temperature controller designed for governing gas-turbine combustion is among the instruments shown in operation.

*Delta Technical Services, Ltd., Cowleaze Road, Kingston-on-Thames, Surrey.*

#### G. P. DENNIS (G7)

Cubicle switch and distribution boards. A range of heavy duty fuse switches and "Hi Style" distribution boards is shown, with samples of substation indoor frames and feeder pillars. Also on view are combined systems of cubicle switchboards and rising mains made by Trunduct, Ltd.

*G. P. Dennis, Ltd., Fleming Road, Speke, Liverpool.*

#### DEX INDUSTRIES (M13)

Portable butane gas appliances including blowlamps, soldering irons, plumbers' furnaces, refrigerant leak detectors and boiling rings.

*Dex Industries, Ltd., Edwin Road, Twickenham, Middlesex.*

#### "DIAMOND H" SWITCHES (H17)

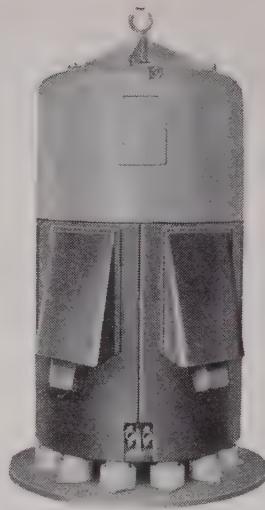
Regulators, thermostats and controllers for domestic appliances; switches and miniature and industrial relays. Among the equipment for domestic appliances on show is the infinite control energy regulator series 10ER for cooker hotplate control, the 20TH series oven thermostat, a prototype of the 1PW series hotplate controller which will thermostatically control the liquid in a cooking utensil on the hotplate, the 3-7AC range of heater switches and the low temperature 12AC washboiler and washing machine switch. In addition there is a series of toggle switches, snap-in switches, neon indicators, miniature relays, the BW type industrial relay and a new 35 A cooker switch.

*Diamond H" Switches, Ltd., Gunnersbury Avenue, London, W.4.*

#### DIMPLEX (J8)

Heating appliances for domestic, commercial and industrial use. Towel rails on view include two new models. The TRC.130 is chromium plated and rated at 130 W, and the Model TRS.175 is finished in stove enamel and loaded at 175 W. Both are 2in wide. Also on view are thermostatically controlled oil-filled radiators, also skirting board type heaters available in two sizes—2ft (300 W) and 3ft (500 W)—and 750 W and 1,500 W portable infra-red heaters. Overhead radiant heaters also shown on this stand are available in 2½ and 4 kW ratings.

*Dimplex, Ltd., Millbrook, Southampton, Hampshire.*



Electric Construction Co. vertical spindle  
250 kW 10 kc/s motor-generator for  
induction heating

#### DONOVAN ELECTRICAL (F2)

Industrial contactor gear and associated equipment, low voltage transformers, electronic control systems and electronic proximity switches. A general display of controllers, motor starters, relays, contactors, and other control accessories is on view. In addition there is the "Runtact" power duct system for cranes, hoists and portable tools; industrial switch sockets; plugs; changeover and crane trolley wire safety switches; load breaking isolating switches and "Reylolvolt" low voltage transformers. The "Access" system of electronic control is being shown together with electronic proximity switches.

*The Donovan Electrical Co., Ltd., 70/82, Granville Street, Birmingham, 1.*

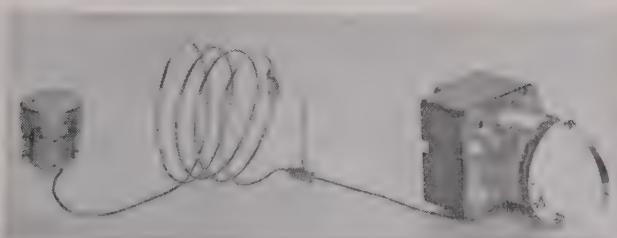
#### DORMAN & SMITH (H14)

Cubicle and ironclad switchboards, miniature circuit-breakers, distribution system, switch and fusegear, lighting fittings and electrical accessories. The "Loadmaster" miniature circuit-breakers on show are made in ratings up to 50 A in single-, double- and triple-pole units up to ten-ways, and the "Loadcentre" distribution system incorporates moulded case circuit-breakers rated up to 400 A. Other products exhibited include "TS" switchgear up to 750 A, h.b.c. cartridge fuse links, distribution fuseboards, lighting fittings and electrical accessories.

*Dorman & Smith, Ltd., Preston, Lancashire.*

#### D.P. BATTERY (J5)

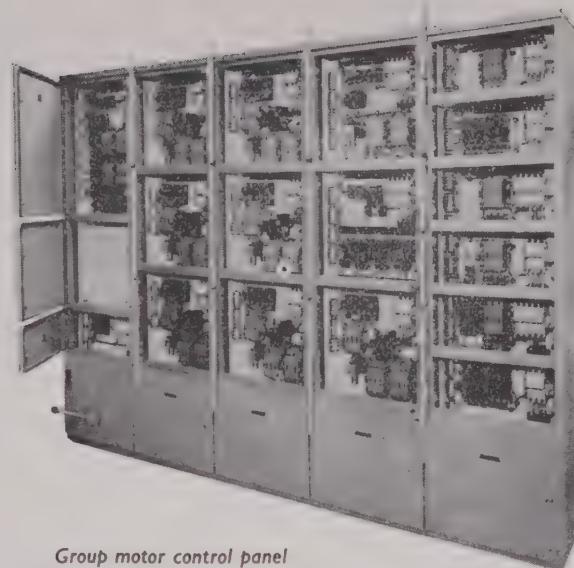
Batteries for stationary, traction and other duties. Featured are high performance "Tudor" stationary cells in sealed glass boxes and 24 V "Safety-lyte" emergency lighting equipment which is being demonstrated. Other emergency lighting equipments on trickle-charge and with a floating battery are being shown and there is a



Thermostatic hotplate controller ("Diamond H" Switches, Ltd.)



Dimplex model TRF.750 ½ kW infra-red portable fire

Group motor control panel  
(The Donovan Electrical Co., Ltd.)

30 V self-contained switch tripping equipment.

*The D.P. Battery Co., Ltd., Bakewell, Derbyshire.*

#### D.S. PLUGS (H14)

Industrial plugs, sockets and connectors; bench distribution units; and electrical accessories including plugs and sockets to B.S. 1363, cooker control units, slow-break switches up to 100 A double pole, and a shaving adaptor.

*D.S. Plugs, Ltd., Salterbeck, Workington, Cumberland.*

#### DUBILIER CONDENSER (K20)

Capacitors, regulators, relays and rheostats. The wide range of capacitors shown on this stand includes "Duconol" capacitors for fluorescent lighting, street lighting and other a.c. applications; power factor correction capacitors and their associated automatic control equipments; "Drilitic" a.c. capacitors and "Duconol" water-cooled capacitors for high frequency furnaces. Other equipment on view includes automatic regulating equipment for generators, electromagnetic mercury switch relays, and tubular slide-wire rheostats and resistances.

*Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.*

#### DYSON (X2)

Pressure diecastings in aluminium and zinc base alloys. The exhibits include castings weighing from a few grammes up to 12 lb produced by the pressure diecasting process. These can be supplied in the "as cast" condition and also machined, finished and plated.

*Dyson & Co., Enfield (1919), Ltd., Southbury Works, Enfield, Middlesex.*

#### EASIPOWER APPLIANCES (W5)

Domestic appliances. In addition to the range of single-heat "Dreamland"

electric blankets, "Perfectaire" fan heaters and "Daleware" holloware, details are being announced of a new luxury three heat, two colour electric blanket designed principally for use as an underblanket. The element is waterproofed and is placed between layers of an incombustible cellular material. This is enclosed in flame-proofed fleeced rayon outer covers.

*Easipower Appliances, Ltd., 30, High Street, Southampton.*

#### E.C.C. (MOULDED BREAKERS) (FII)

Low voltage distribution switchgear. Moulded-case air circuit-breakers including the "Stab-Lok" type are shown together with associated distribution boards including flush-mounting types, and consumer distribution units for single and two-part tariffs. A common feature of moulded circuit-breakers is the hot moulded phenolic plastic case.

*E.C.C. (Moulded Breakers), Ltd., Fordhouse Road, Wolverhampton.*

#### E.F. ELECTRIC (F19)

Wiring accessories. The complete range of electric wiring accessories shown is available in brown, ivory, white or ruby colours. Exhibits include "Mini-Gang" switches; 13 A plaster depth sockets, single or twin, switched or unswitched; a 10 A ceiling switch available as a double-pole one-way or single-pole one- and two-way unit, 2 A three-pin flush and surface switch sockets with or without shutters and a 2 A three-pin socket flush or surface also with or without shutters.

*E.F. Electric, Ltd., Willow Lane, Watford, Herts.*

#### EKCO-ENSIGN ELECTRIC (F7)

Lamps, lighting fittings and control accessories. The range of lighting products shown on this stand includes the "Essex" range of fluorescent fittings and the Super Slim popular pack. A range of modular ceiling

fittings are also shown together with special decorative fluorescent fittings, anti-corrosive and weatherproof fittings, fluorescent tubes, tungsten filament lamps, mercury and sodium discharge lamps and control gear and accessories.

*Ekco-Ensign Electric, Ltd., 45, Essex Street, Strand, London, W.C.2.*

#### ELECTRAN COIL CO. (P17)

See Expert Industrial Controls, Ltd.

*The Electron Coil Co., Ltd., Lout Works, Ashby-de-la-Zouch, Leicestershire.*

#### ELECTRIC & ORDNANCE ACCESSORIES (U5)

Porcelain insulators. Examples from the die-pressed porcelain parts for electrical appliances and accessories of all types are shown. Also displayed are high voltage insulators for use on voltages up to 33 kV.

*The Electric & Ordnance Accessories Co., Ltd., P.O. Box No. 1, Havelock & Shelton Potteries, Hanley, Stoke-on-Trent.*

#### ELECTRIC CONSTRUCTION CO. (FII)

Motors, generators and motor control equipment including contactors and magnetic amplifiers. Among the rotating machines shown is a vertical-spindle 10,000 c/s motor-generator designed for induction heating, etc. Rated at 250 kW, it operates on a 415 V 50 c/s supply. A naturally cooled magnetic amplifier power pack for controlling a 6 h.p. a.c. motor is shown. This particular unit can give a response time at the motor shaft of 20 milliseconds from standstill to 2,200 r.p.m. Control is available over a 20 to 1 speed range. Other products on display include a switchboard complete with contactors, relays, instruments, automatic regulators, etc.

*The Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton.*

### ELECTRICAL APPARATUS CO. (K17)

Motor control gear and accessories. A.c. and d.c. manually-operated and fully automatic motor control gear, plug-in type motor control centres and cubicle type multi-motor starting equipment are on display. Drum and cam operated controllers and air break circuit-breakers are shown, also overload and single-phasing preventors and instruments including a new 2½ in rectangular pattern instrument, a 3in frequency meter and examples of miniature moving-coil units. Other accessories shown include float switch-gear, rotary selector switches, push buttons and pilot lights. A new range of a.c. and d.c. contactors is also shown. Demonstrations are being given of the "Digivisor," suitable for the read-out from transistorised decades without intermediate amplification.

*The Electrical Apparatus Co., Ltd., New Barnes Avenue, Mile House Lane, St. Albans, Hertfordshire.*

### ELECTRICAL ASSOCIATION FOR WOMEN (O1)

Kitchen planning is illustrated on this stand, the main feature being the winning entry in a kitchen planning photographic competition. Outstanding points highlighted in this display include the wiring, which is elaborated by the adjoining stand of the National Inspection Council for Electrical Installation Contracting.

*Electrical Association for Women, 25, Foubert's Place, London, W.1.*

### ELECTRICAL DEVELOPMENT ASSOCIATION (B4)

The latest developments in electric heating for all buildings are featured. The full range of E.D.A.'s Industrial Publications is available.

*Electrical Development Association, 2, Savoy Hill, London, W.C.2.*

### ELECTRICAL DIVISION OF RADIATION (S16)

Domestic appliances. The Parnall home laundry equipment includes the semi-automatic spinwasher, "Auto-Dry" tumbler dryer and the "Ezy-Press" flat-bed ironer. A new product on show is the "EW52" wringer washer. The "Vibra-Beat" suction cleaner is the other Parnall model on display.

The Jackson equipment on display includes the "494" and "493" models of the "Highline" cooker together with the "Estate" and "69 Giant" models, and the "202" refrigerator, the "777" convector, the "Masterpiece" convector and the "921/923" water heaters.

*Electrical Division of Radiation, Ltd., 255, North Circular Road, Neasden, London, N.W.10.*

### E.I.B.A. (O10)

The Electrical Industries Benevolent Association work is described and particulars of membership are also

given. Copies of the Year Book and other literature are available.

*Electrical Industries Benevolent Association, 10, Buckingham Palace Gardens, London, S.W.1.*

### ELECTRICAL REMOTE CONTROL (L16)

Timing units, relays and d.c./a.c. convertors. The timing units shown include dial set adjustable timers, automatic reset and continuously cycling multi-circuit adjustable hand timers, solenoid operated escapement timers and condenser discharge timers. Two new multi-contact relays are shown, and a new d.c./a.c. convertor unit is also displayed.

*The Electrical Remote Control Co., Ltd., The Fairway, Bush Fair, Harlow, Essex.*

### E.R.A. (B3)

The six research divisions of the British Electrical and Allied Industries Research Association (E.R.A.) are represented in this display. Examples of current E.R.A. work are connected with insulation (a direct study of the fundamental processes of breakdown by the use of a liquid dielectric), generating plant (steels for high temperatures), transformers and switchgear (a study of arc extinction), power supply lines and cables (short-circuit tests on various types of cables), industrial applications (contactor wear has been found to be related to the coulombs passing through the contacts during arcing) and non-industrial applications (control of glasshouse shading by a photocell).

*British Electrical and Allied Industries Research Association, Cleeve Road, Leatherhead, Surrey.*

### ELECTRICAL REVIEW (A6)

Representatives are available on our stand to deal with technical and commercial inquiries.

*"Electrical Review" (Iliffe Electrical Publications, Ltd.), Dorset House, Stamford Street, London, S.E.1.*

### ELECTRICAL WHOLESALERS' FEDERATION (A5)

The Electrical Wholesalers' Federation insists on high standards of quality as qualification for membership. The director and staff are available at the address below to advise manufacturers wishing to distribute through the electrical wholesale trade.

*Electrical Wholesalers' Federation, 34-37, Cursitor Street, London, E.C.4.*

### ELECTRO-DYNAMIC (L14)

Rotating electrical machines and control gear. A feature of this stand is a working model of a 100 W transistorised invertor. The range of rotating electrical machines shown include rotary convertors, high-frequency alternators for radar, telecommunication and electronic use, machines up to 10,000 c/s for h.f.

induction furnaces and motors for battery driven vehicles. A carbon stack controller developed for use with battery vehicles is also shown.

*The Electro-Dynamic Construction Co., Ltd., St. Mary Cray, Kent.*

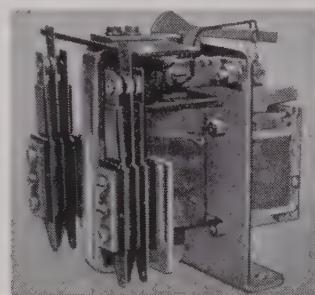
### ELECTRO MECHANICAL MFG. (G19)

Motor control equipment and switch-gear. Switch and motor control gear for both indoor and outdoor conditions of normal or tropical service up to 660 V is on view. Flush fronted cubicle control gear forms the main exhibit and incorporates switches, fuse switches, circuit-breakers, distribution panels, and motor control circuits.

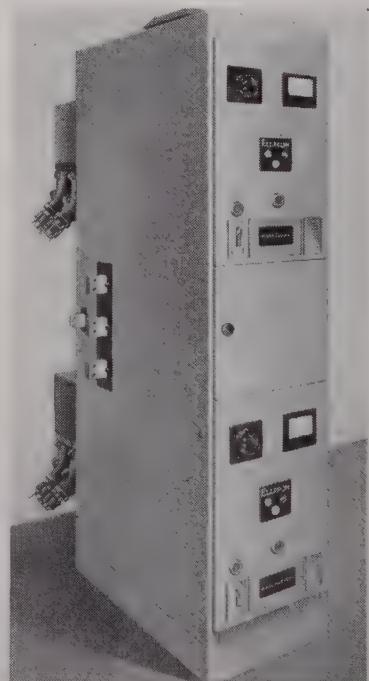
*The Electro Mechanical Manufacturing Co., Ltd., 133-135, Grand Buildings, Trafalgar Square, London, W.C.2.*

### ELECTRO METHODS (J26)

Relays, thermostatic devices, low inertia d.c. servo motors for miniature



*Electrical Remote Control Co., Ltd., electrically reset multi-contact latching relay*



*George Ellison double-tier 600 V air-break circuit-breaker unit with sealed busbar chamber*

chart recorders, magnetic amplifiers and saturable reactors, transistor controlled relays and integration equipment.

*Electro Methods, Ltd., Caxton Way, Stevenage, Herts.*

#### ELLIOTT BROS. (F14)

Measuring instruments, test sets, recorders, laboratory equipment and servo and other small electric motors. The display includes panel instruments; moving coil, moving iron and dynamometer test sets; Petch-Elliott voltage and current transformer test sets; chart recorders and d.c. switchboard instruments. Among the other exhibits is a programmed automatic circuit checker for continuity, insulation and resistance; a phase rotation indicator; and counters for industrial process control. A transistorised tone telemetry system using frequency division multiplexing for transmitting up to thirty data channels over a telephone or radio link is demonstrated.

*Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.*

#### GEORGE ELLISON (D7)

Industrial and high voltage switchgear. On show for the first time is a range of air-break switchgear for use on voltages up to 660 V. Each unit consists basically of flush-fronted sheet steel cells in which are housed horizontally-isolated double-tiered circuit-breakers or off-load isolators and a centre metering panel. The 800 A breaker has been certified to ASTA No. 16 for 31 MVA, class A, and 26 MVA, class B, at 415 V. The breakers may be manually, spring-assisted or solenoid closed.

*George Ellison, Ltd., Perry Barr, Birmingham, 22B.*

#### ELLISTON, EVANS & JACKSON (Y8)

Electro-mechanical and hydraulic brakes; solenoids; and switch and control equipment for lifts. The ranges of "Elevanja" electro-mechanical hydraulic brakes shown are suitable for solenoid, thruster or hydraulic cylinder operation. A special feature

on the stand incorporates a range of type "J" a.c. brakes for motor end-shield mounting.

*Elliston, Evans & Jackson, Ltd., Bath Bridge Engineering Works, Bath Road, Bridgwater, Somerset.*

#### E.M.B. CO. (G2)

Crane control gear. Featured on this stand is an armchair control for cranes with master controllers for the operation of contactor gear. The right hand operates the controller for a two-motor grab and the left controls the travel and traverse motions through a universal lever gear. The contacts are double-break silver faced type for operation up to 660 V. They are spring applied and mechanically opened by independently adjustable cams.

*E.M.B. Co., Ltd., Moor Street, West Bromwich, Staffordshire.*

#### EMP ELECTRIC (U2)

Fuses and fuse links, expulsion cutouts and lightning arrestors. Fuses for operation at voltages up to 66 kV are shown, including fuse links for the protection of semiconductor rectifiers. Current limiting cartridge fuse links with glass fibre shrouds are exhibited together with high voltage expulsion cutouts fitted with a load break device for both 11 and 33 kV equipment. A valve type lightning arrestor for 11 kV systems which can be installed on rural transformers is on view and exhibits show the construction of a new gap design incorporated in arrestors operating at system voltages up to 400 kV.

*EMP Electric, Ltd., Garman Road, Tottenham, London, N.17.*

#### E.M.S. ELECTRICAL PRODUCTS (G18)

Miniature busbar and other distribution systems. The exhibits include "Trolleyduct" single-phase feed rail, "Miniplug" distribution duct for lighting and small power supplies, "Minibus" miniature busbar system, and "Trolleymaster" guarded power track for cranes, hoists, etc. New "Trolleymaster" products include the series 100 Mk. II with new design features and a 250 A collector system.

*E.M.S. Electrical Products, Ltd., Common Lane, Kenilworth, Warwickshire.*

#### ENFIELD-STANDARD POWER CABLES (G12)

Cables, distribution equipment and overhead line gear. The display includes electric cables of all types for use at voltages up to and including 275 kV; distribution equipment; joint boxes and cable accessories; moulded rubber plugs and sockets and busbars.

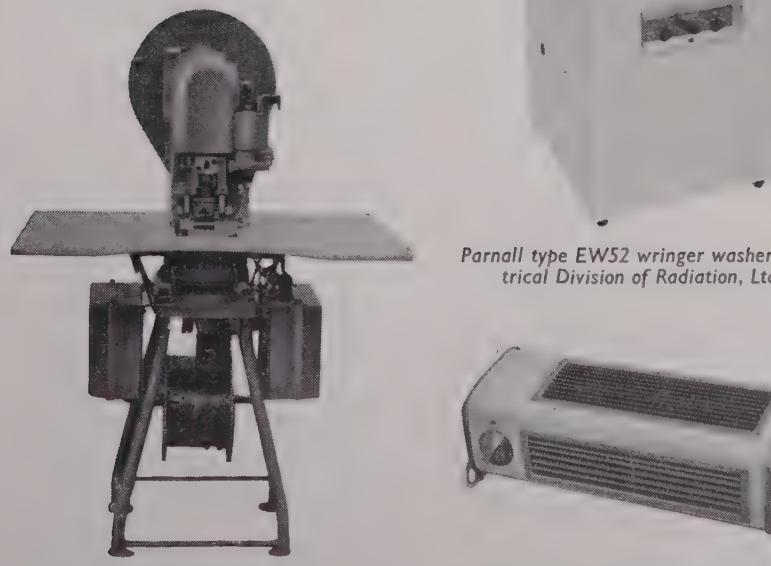
*Enfield-Standard Power Cables, Ltd., Brimsdown, Enfield, Middlesex.*

#### ENGELHARD HANOVIA LAMPS (T10)

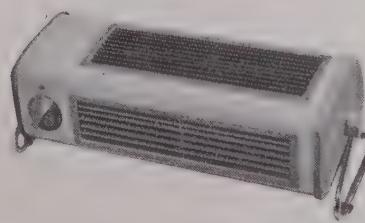
Domestic heating equipment. The "Radisil" radiant heater is available



E.M.S. Electrical Products  
"Trolleymaster 250" collector track system



Parnall type EW52 wringer washer (Electrical Division of Radiation, Ltd.)



Engelhard Hanovia Lamps "Turboflo" 3 kW fan heater

Erma "Crimpermatic" automatic terminal crimping machine

in 600, 800 or 1,500 W versions. Also shown is the "Turboflo" heater which has three switch selected ratings of 750, 1,500 or 3,000 W, and a two-speed fan.

*Engelhard Hanovia Lamps, Bath Road, Slough, Bucks.*

#### EIGA (O4)

The Engineering Industries Group Apprenticeship scheme enables small and medium sized firms to train apprentices to a standard comparable with those in the large firm training schemes. At present EIGA is helping to train some 700 apprentices in 340 member firms throughout the country.

*Engineering Industries Group Apprenticeship (EIGA), 10, Great North Road, Hatfield, Herts.*

#### J. ENGL (S5)

Flexible metallic tubing, vacuum cleaner hose, flexible arms for desk and inspection lamps, electro-galvanised steel cable channelling, p.v.c. covered flexible tubing, rigid mild steel close joint and welded tubing for electrical conduit and other purposes and cable glands.

*J. Engl, Ltd., Bennett Street, Bridgend Industrial Estate, Bridgend, Glamorgan.*

#### ENGLISH ELECTRIC (M11 & T4)

Heavy electrical plant, switchgear, transformers, rectifiers, industrial machines, control gear, mining equipment, fuse gear, meters, relays, instruments and domestic appliances. The exhibits on stand M11 include a multi-motor control centre incorporating units which can be rated from fractional to 400 h.p., and contactless sensing devices and transistorised logical elements from the "Unistat" range. Other exhibits are an indoor packaged substation with a 1,000 kVA transformer, a medium voltage fuse cabinet, distribution fuseboards, a combination fuse switchboard incorporating an air circuit-breaker and heavy duty switches, fuse fittings including pole mounted types and cartridge fuse links. Four new meters, relays and instruments on show are a switched Mho distance protection scheme, an earth fault relay, a single shot auto-reclose relay and a torque balance convertor. Among the industrial machines are "D" type totally enclosed fan cooled motors, including flameproof types, "C" type ventilated motors, an "exploded" 130 h.p. motor, and a number of vibrator motors.

Products of the domestic appliance division are being shown separately on stand T4. These include the 2.7, 4.1 and 9.4 cu ft model "Slimline" refrigerators and plinth type cookers with "Veeline" hotplates, an automatic oven timer, an inner glass oven door and an interior light. Also shown are the "Liberator" washing machine and "Tumble-Dry" dryer.

*English Electric Co., Ltd., English Electric House, Strand, London, W.C.2.*

#### EQUIPMENT & SERVICES (L16)

Timers and relays. See under Electrical Remote Control Co., Ltd.

*Equipment & Services, Ltd., Bush Fair, Harlow, Essex.*

#### ERMA (S14)

Solderless terminals, cable lugs, crimping equipment and wire strippers. Among the new products on show is the "Crimpermatic" automatic terminal attaching machine which can crimp terminals at rates up to 4,000/hr, and accessories for "Solidal" conductors.

*Erma, Ltd., Mount Pleasant, Alperton, Wembley, Middlesex.*

#### ERSKINE, HEAP (A9)

Switchgear and motor control gear. The switchgear exhibits include vertical isolation units up to 31 MVA at medium voltage, 75 MVA at 3.3 kV and 250 MVA at 6.6/11 kV. In addition there are examples of motor control gear, both of the hand operated and contactor type for direct-on, star-delta, auto-transformer and stator-rotor starting. Emphasised are the contactor type starters which can be embodied in multi-motor control panels. Other products being shown are d.c. circuit-breakers, knife switches, fuses, isolating links and moving iron am-

meters and voltmeters. Flameproof switchgear and motor control gear is also on view.

*Erskine, Heap & Co., Ltd., Lancashire Switchgear Works, Manchester, 7.*

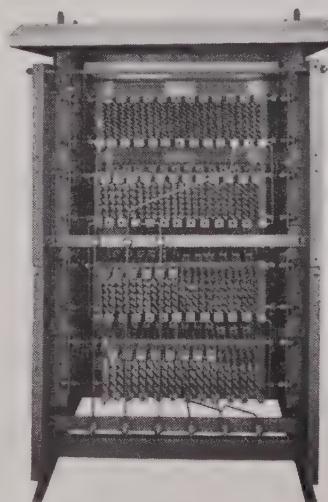
#### ESWA (W3)

Low temperature radiant ceiling heating. This system employs an electrically heated resistance foil between resin treated mats of kraft paper which are installed immediately behind the ceiling face. The average temperature of the ceiling is 85 to 90°F for an air temperature of 65 to 70°F. The heated area extends over some 50 to 80 per cent of the whole ceiling, and the element loading is either 15 or 20 W/sq ft. For average sites the installed load is between 7 and 10 kW/1,000 sq ft.

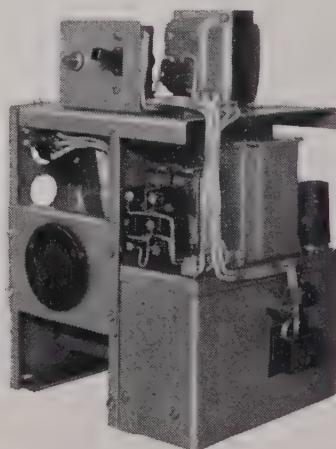
*Eswa, Ltd., 26, Newman Street, London, W.I.*

#### ETHER (J26)

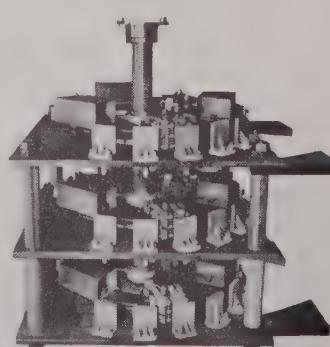
Temperature and process control equipment. The items on view include both potentiometric and galvanometer type recorders and controllers having on/off, anticipatory, stepless, proportioning and programme action. Other exhibits include multipoint indicators and recorders, surface tem-



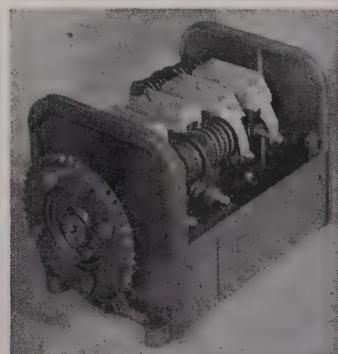
Fawcett Preston "F.P. Service" resistor for steelworks duty



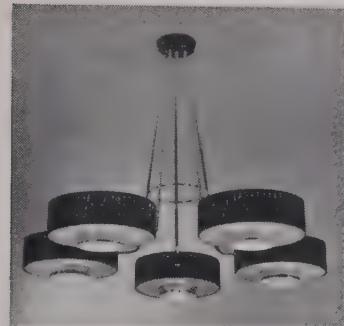
Interior of Cressall a.c. voltage stabiliser made by the Expanded Metal Co., Ltd.



Radial on-load tapping switch for 33 kV high speed resistor on-load tap-changer (Fuller Electric, Ltd.)



Expert Industrial Controls type SLMS limit switch incorporating a striker-operated contactor



*Capri lighting fitting  
(Falk, Stadelmann &  
Co., Ltd.)*



*Spring jewel assembly for meters (J. P. Filhol, Ltd.)*

perature measuring instruments, solenoid operated valves, and combustion safeguards.

*Ether, Ltd., Tyburn Road, Erdington, Birmingham, 24.*

#### **EVERETT, EDGCUMBE (C4)**

Indicating and recording instruments and timers. The dwarf "Inkwell" recorder has a 4in chart and occupies a panel space of 7in by 7in. Full-scale deflection can be as low as 150  $\mu$ A. With three pairs of gear wheels and a two-speed gear box six different chart speeds can be obtained.

*Everett, Edgcumbe & Co., Ltd., Colindale Works, Colindale Lane, Hendon, London, N.W.9.*

#### **EVERSHED & VIGNOLES (CI)**

Electrical testing and recording instruments, servo-motors and motor-generators. The range of "Megger" insulation and continuity testers and earth, neutral earth and line earth loop testers on show now includes the "Two-in-One" Wee-Megger instrument which incorporates facilities for insulation and continuity testing. Among the recording instruments on view is a disc recorder available with wattmeter, ammeter or voltmeter movements and a transistorised quick response recorder which is servo-operated and has a built-in amplifier. This instrument records voltage transients up to 25 c/s with an amplitude error not exceeding 10 per cent for peak to peak amplitudes of 1½in. Also shown is a selection of servo-motors and motor-generators and a television camera with the pan, tilt, zoom, focus and iris functions servo-operated.

*Evershed & Vignoles, Ltd., Acton Lane, London, W.4.*

#### **EXPANDED METAL (K24)**

Industrial resistors, heaters and control equipment. The exhibits include "Expamet" heavy duty traction and

loading resistors and typical expanded metal resistor elements. "Barmet" continuous strip and "Edgemet" edge-wound strip elements are also on view.

*Expanded Metal Co., Ltd., Burwood House, Caxton Street, Westminster, London, S.W.1.*

#### **EXPERT INDUSTRIAL CONTROLS (P17)**

Industrial solenoids, motor control gear and limit switches. The main group of exhibits is the "Decco" range of industrial solenoids. Shown for the first time is a new "M.S." range of manual controllers for battery electric vehicles and for a.c. and d.c. crane motors, and Denison "Lox-switch" limit switches.

*Expert Industrial Controls, Ltd., Lount Works, Ashby-de-la-Zouch, Leicestershire.*

#### **FALK, STADELMANN (K13)**

Lighting fittings, wiring accessories, floor warming cables and electrical appliances. The Ranmore high bay indoor lighting reflector on show has been designed for use with high power colour-corrected mercury lamps. Three sizes of this spun aluminium reflector are available to take either a 250 W, a 400 W or a 1,000 W MBF/U lamp, each size giving a 20° cut-off. The new "Capri" pendant fitting with polished brass suspension and drum shade units is available as a five-light pendant or a three-light ceiling fitting for 100 W lamps. The "Supersil" free standing infra-red reflector fire has three 750 W silica-encased spiral elements. Other products on display include the "Cordcone" ceiling switch.

*Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.*

#### **FARADAY HOUSE (O17)**

Faraday House Engineering College, at the exhibition for the first time, is illustrating its courses for the three



*Automatic multi-motor contactor switchboard (Erskine, Heap & Co., Ltd.)*

awards of Diploma of Faraday House (D.F.H.), Graduate of Faraday House (G.F.H.) and Associate of Faraday House (A.F.H.). The exhibits include a timing device, constructed as part of a student project, which was developed at the college.

*Faraday House Engineering College, 66, Southampton Row, London, W.C.1.*

#### **FAWCETT PRESTON (T3)**

All types of resistors. The main exhibits include a "F.P.Hi-Temp" main starting resistor for Central Indian Railways, 4,000 h.p. locomotives, and a similar resistor for a flameproof mining locomotive. The "Hi-Temp" strip resistor shown has all the insulators on the outside edges of each bank to allow free access of air throughout.

*Fawcett Preston & Co., Ltd., Bromborough, Cheshire.*

#### **FENTON, BYRN (K1)**

Industrial and domestic ventilating and heating equipment. Ring, wall and ceiling fans, motorised roof ventilators, with and without backdraught shutters, domestic kitchen canopy complete with extractor fan, cabinet and wall type convectors and electric unit heaters are displayed.

*Fenton, Byrn & Co., Ltd., Airflow Works, Berrylands Road, Surbiton, Surrey.*

#### **FERRANTI (C5)**

Transformers, regulators, reactors, instruments, silicon semiconductor devices and test equipment. On-load tap-changers and divertor switches are shown together with a moving coil voltage regulator, the core and winding assembly of a 50 kVA saturable reactor and a six-stage 330 kV impulse generator of the horizontal capacitor design. Electricity meters shown include pre-payment and Whr meters, maximum demand meters for single-phase and polyphase systems and a combined

kWh meter and thermal demand ammeter. Instruments shown include pole type clip-on ammeters, the "Miniclip" voltammeter, long-scale and hermetically sealed instruments, a phase-earth loop impedance tester and a high sensitivity peak accelerometer. Electronic summation metering equipment and the new Excess Demand Warning System are featured. A radar type fault locator for h.v. lines is being shown and other exhibits include low, medium and high-power silicon rectifiers. Silicon epoxy-sealed, low-power rectifiers shown have a mean current rating of 500 mA at 65°C ambient temperature with a high surge rating of 35 A for 5 msec. A 2 kW panel fire is also displayed.

*Ferranti, Ltd., Hollinwood, Lancashire.*

#### FIBREGLASS (S13)

High structural strength components moulded in Fibreglass reinforced plastics including an alternator end cover, a tap changing transformer panel and commutator vee rings are displayed. Application of Fibreglass to overhead railway electrification is demonstrated by section insulators and a track circuit meter case, while other exhibits illustrate the electrical applications of Fibreglass dough mouldings.

*Fibreglass, Ltd., Ravenhead, St. Helens, Lancashire.*

#### H. W. FIELD (U6)

Lighting fittings and accessories. The range of industrial and commercial fluorescent fittings shown include the Slimline-POP channel and reflectors. The "Fildenex" range of unbreakable lampshades is also shown. New products shown include battens, reflectors and diffusers having a common channel and easy fixing facilities. Other products shown include control gear compacts for all sizes of lamps and separate items of "Resicast" control gear.

*H. W. Field & Son, Ltd., Harold Wood, Essex.*

#### J. P. FILHOL (N9)

Jewel bearings for instruments, meters and watches and other instrument parts.

*J. P. Filhol, Ltd., Millers Road, Warwick.*

#### FIRTH CLEVELAND INSTRUMENTS (V8)

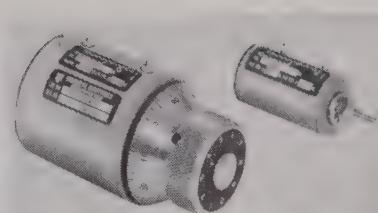
*See Simmonds Aerocessories, Ltd.*

*Firth Cleveland Instruments, Ltd., 7, Cleveland Row, St. James's, London, S.W.1.*

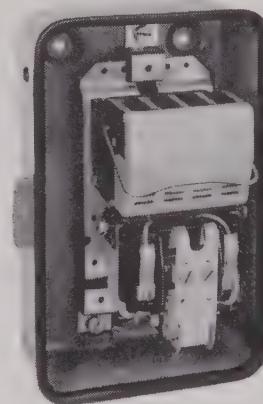
#### FITZGIBBON & MURRAY (EI)

Domestic switches, lamp holders, bells, bell transformers, clock movements and time switches.

*Fitzgibbon & Murray, Ltd., Smallfield Works, Horley, Surrey.*



General Controls helical potentiometers



G.E.C. 20 A four-pole vertical lift contactor



G.W.B. Furnaces control panel

#### V. & E. FRIEDLAND (J7)

Industrial and domestic bells and chime equipment. The complete range of products including buzzers, transformers and pushes are shown, as well as chime and bell kits.

*V. & E. Friedland, Ltd., Macclesfield, Cheshire.*

#### H. FROST (Z7)

Domestic and industrial heaters and fans. The range of "Sunhouse" infrared beam heaters and inset and wall panel fires are displayed.

*H. Frost & Co., Ltd., Fieldgate, Walsall, Staffs.*

#### FULLER ELECTRIC (L4)

Transformers and commutator motors. A skeleton single-phase 132 kV fully insulated high-speed resistor on-load tap-changer, a direct drive mechanism and a 33 kV 200 A high-speed on-load tap-changer with integral drive mechanism are shown. The variable speed a.c. commutator motor shown demonstrates the infinite stepless speed adjustment of the machines. The drive from this machine incorporates a device (Torductor) to demonstrate a new principle in torque measurement. Also shown is a sectioned unit of electric power track with collectors rated up to 200 A on 415 V a.c. supply or 400 A on d.c. supply. The company's part in the cross-Channel power supply link is illustrated by an illuminated map and a model of a rectifier transformer.

*Fuller Electric, Ltd., Fulbourn Road, London, E.17.*

#### GAINSBOROUGH ENGINEERING

(Q3)

*See G. Corner & Co., Ltd.*

*The Gainsborough Engineering Co. (Oldham), Ltd., Park Works, Middleton.*

#### GEORGE FORREST (J16)

*See Atlas Lighting, Ltd.*

*George Forrest & Son, Ltd., Arundel Road, Industrial Estate, Uxbridge, Middlesex.*

#### FOSTER TRANSFORMERS (E7)

High voltage transformers, voltage regulators and test sets. New products shown by this company include constant voltage transformers and anodised aluminium foil wound transformers. Other products shown include current injection test sets, "Troidac" toroidal auto-wound voltage regulators, 33 kV voltage transformers and automatic voltage regulators.

*Foster Transformers, Ltd., Morden Rd., South Wimbledon, London, S.W.19.*

#### FRACTIONAL H.P. MOTORS (D3)

Universal, split phase, capacitor, three-phase, synchronous, and shaded pole f.h.p. motors. This display also includes geared units from 0.125 to 600 r.p.m.

*Fractional H.P. Motors, Ltd., Rookery Way, Hendon, N.W.9.*

**GENERAL CONTROLS (PI5)**

Potentiometers. A rectilinear potentiometer with a resistance range from 100 Ω to 10 kΩ and with balanced suspension wipers, three- and ten-turn/helical potentiometers with maximum resistance values between 40 and 500 kΩ, servo potentiometers with ratings of 2 and 4 W and multi-tapped servo potentiometers available in up to 14 gangs with 300 tapping points are displayed. Digital turns counters for positioning or reading precision rotating components such as multi-turn potentiometers and variable capacitors, and a control knob which can be locked in any position over a rotation of 300° are also shown.

*General Controls, Ltd., 13/15, Bowlers Croft, Honywood Road, Basildon, Essex.*

**G.E.C. (H12 & V2)**

Heavy electrical machines, switchgear, cabling and wiring accessories, lighting fittings, industrial and domestic heating equipment and domestic apparatus. Prominent in the Engineering Group's display on stand H12 is a 17ft long control console for a 68in six-stand hot strip finishing mill. Shown for the first time is an 11 kV 250 MVA switch-fuse ring main unit and an example of the class KA metalclad switchgear range. Other exhibits include industrial motors and starters. Installation equipment on view includes the "Mutac Clipper" range of a.c. accessories in moulded, industrial and brass decorative patterns, "Hidutac" switchfuses and new 15 and 30 A isolators, a range of "Cromwell" switchgear; 13 A ring main accessories, a new heavy duty rising main, a new 20 A four-pole vertical-lift contactor, trunking and overhead busbars.

Among the lighting equipment shown on stand V2 is a new range of commercial fittings, samples of the new "Infinilite" illuminated ceiling panels, and two of the 101 lighting fittings. Osram lamps for use in aircraft, ships, underground and other applications are shown and special lamps developed for laboratories, operating theatres and street lighting, sealed beam lamps, projector lamps, miniature fluorescent tubes and quartz infra-red lamps. The heating equipment shown includes the new 3 kW "Nightstor" heater, twin-zone radiant heaters, a 10 kW low-level space heater, 3, 5 and 20 kW fan heaters, a 36 kW hot water circulator, industrial infra-red heaters, the "Sanfire Major" and "Minor" incinerators and an individual room air conditioner. New domestic equipment includes three- and four-plate versions of the "Treasure" cooker, a 2½ cu ft refrigerator, the "Sto-a-way" undersink water heater and the hot-air "Firelighter."

*The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.*

**GENT (K22)**

Fire alarms, clocks, bells, buzzers and other sound signals. The display

includes equipment to demonstrate various systems of electrical fire alarms including an automatic detector system complete with a link direct to a fire station. The sound signal equipment shown includes staff location equipment, liquid level indicating and recording equipments, process timers and burglar and mains failure alarms.

*Gent & Co., Ltd., Faraday Works, Leicester.*

**GILFLEX CONDUITS (X15)**

Flexible and rigid plastic conduits and fittings, including oval conduits. New this year is plastic cable trunking for which a comprehensive range of fittings is available.

*Gilflex Conduits, Ltd., 41, The Parade, High Street, Watford, Herts.*

**W. T. GLOVER (Q10)**

Transmission, distribution and mining cables. A working model on view demonstrates the company's method of impregnating paper insulants. The dielectric produced is guaranteed to be completely non-draining at maximum temperatures under all conditions of installation. In addition to paper insulated cable, a range of plastic insulated power cables is displayed.

*W. T. Glover & Co., Ltd., Trafford Park, Manchester, 17.*

**GORDON MILLER (P14)**

Coal effect and infra-red fires. One model in the "Masterpiece" range of coal effect and infra-red fires shown on this stand is the "Rembrandt" which is rated 3 kW and incorporates a fan heater. The "Constable 180" infra-red 900 W fire has a barrel shaped reflector and the switched model 22 1 kW and model 15 750 W infra-red fires have clip-out guards and accessible element connections. The range is completed with two industrial fires fitted for ceiling hanging.

*Gordon Miller, Ltd., 2, Kings Parade, Lower Coombe Street, Croydon, Surrey.*

**GRAPHITE PRODUCTS (H5)**

*See Morgan Crucible Co., Ltd.*

*Graphite Products, Ltd., Point Pleasant, London, S.W.18.*

**GREENWOOD AIRVAC (R14)**

Under floor, skirting and floor surface duct systems. A feature of the stand is a combined demonstration layout of the under floor duct system and the standardised "Flushfy" floor duct system. The under floor system is suitable for a minimum screed depth of 1½ in and embodies adjustable floor outlets, a remote adjustable brass floor frame and a universal floor pedestal unit.

*Greenwood Airvac Conduits, Ltd., Carlisle House, 8, Southampton Row, London, W.C.1.*

**GRUBB ENGINEERING (V10)**

Oil-filled radiators; automatic, embedded, withdrawable and industrial

immersion heaters; thermostat controls; convector and infra-red radiant heaters; and window de-misters.

*The Grubb Engineering Co., Ltd., Mary Street, Balsall Heath, Birmingham, 12.*

**GULF OIL (G13)**

Insulating oils; these include "Gulf-sil" transformer and switch oil, lubricants for electrical contacts, meters and instruments, insulating compounds, greases for rotating machinery and time lag dashpot oils.

*Gulf Oil (Great Britain), Ltd., 6, Grosvenor Place, London, S.W.1.*

**G.W.B. FURNACES (B5)**

Contactors, isolators and control panels. Products of this company's control gear division which are on show include a selection of separate contactors and isolators from their standard range and custom-built automatic control panels.

*G.W.B. Furnaces, Ltd., P.O. Box 4, Dibdale Works, Dudley, Worcs.*

**HACKBRIDGE CABLE CO. (M9)**

Paper insulated, plastic sheathed, plastic insulated, rubber insulated, telecommunication and domestic cables.

*The Hackbridge Cable Co., Ltd., Kelvin Works, Hackbridge, Surrey.*

**HACKBRIDGE & HEWITTIC (C7)**

Distribution and power transformers, rectifiers and h.v. overhead line switchgear. The transformer exhibits include a type ON transformer core and coil assembly and a complete class C unit. A 500 kVA direct buried transformer is being shown for the first time. Rectifiers exhibited comprise a heavy duty mercury-arc equipment employing Hewittic cooled cathode bulbs, shown operating on load. An h.v. silicon transformer/rectifier assembly ready for placing in its tank, a typical silicon battery charger, and a display of Hewittic germanium cells are also shown. The display of overhead line switchgear includes 110 kV and 132 kV equipment and a railway isolator.

*The Hackbridge & Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey.*

**HADDON TRANSFORMERS (R13)**

Power and welding transformers, saturable reactors/transductors, welding reactors, magnetic amplifiers, chokes, battery chargers, cast transformers, transformer/rectifier units, and audio transformers. New products shown include constant voltage transformer units and a three-phase 150 kVA saturable reactor/transductor mounted as a single unit and having a new core configuration.

*Haddon Transformers, Ltd., Victoria Park Industrial Estate, Field End Road, Ruislip.*

**HARMER & SIMMONS (T1)**

Battery chargers and associated equipment. New products shown in-

clude transistor controlled "Cycloc" automatic float chargers, pre-set chargers and battery eliminators and a conventional lead-acid cell fully sealed by a "Catalytor" and demonstrated operating immersed in water.

*Harmer & Simmons, Ltd., Roebuck Road, Hainault, Essex.*

#### HARRIS & SHELDON (D4)

Lighting fittings. The "Circlgrid" moulded p.v.c. louvred ceiling panel is shown, also a 24in version of the "Paragrid" tile in polystyrene. Other new products displayed include the "Stafford" range of fluorescent fittings based on a common backspine. A new series of glass and metal pendants and wall brackets based on the "Fantasie" range of lamps and some metal and perspex pendants designed for contemporary interiors are also shown.

*Harris & Sheldon Electrical, Ltd., 31, Stafford Street, Birmingham, 4.*

#### J. J. HARVEY & PRESSURECAST (P16)

Plastics mouldings. Products shown include single and double skin mouldings in polyester glass fibre. Large electrical mouldings in both polyester and epoxy glass are shown together with dough mouldings, tools for dough mouldings and an example of a glass fibre mould for producing glass fibre mouldings.

*J. J. Harvey & Pressurecast, Ltd., Lime Bank Street, Manchester, 12.*

#### HARVEY HUBBELL (Y9)

Industrial plugs and sockets and connectors. The "Hubbellock" armoured locking connectors for heavy duty portable equipment have dead front safety shutters. The connector can be locked by twisting the plug. These connectors are available in three, four and five pole arrangements with ratings up to 20 A, 250 V d.c. and

30 A, 600 V a.c. The "Twist-Lock" range of plugs, sockets and connectors in rubber and armoured bakelite are also shown. New products on view are the "Chem-Marine" corrosion resistant accessories.

*Harvey Hubbell, Ltd., P.O. Box 10, Knoll Road, Camberley, Surrey.*

#### HAWKE CABLE GLANDS (S10)

Cable glands, sealing boxes, junction and joint boxes and a range of controlled compression type cable glands.

*Hawke Cable Glands, Ltd., Ashworth Street, Denton, Manchester.*

#### L. G. HAWKINS (L13)

Domestic appliances. The new deluxe model "Hi-Dry" electrically heated telescopic clothes dryer and airer shown has automatic cut-out, pilot light and removable rack. A new coal-effect fire and the "Florida" combination radiant convectors are also displayed together with automatic tea makers, kettles, irons, toasters, hairdryers, etc.

*L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, London, W.C.2.*

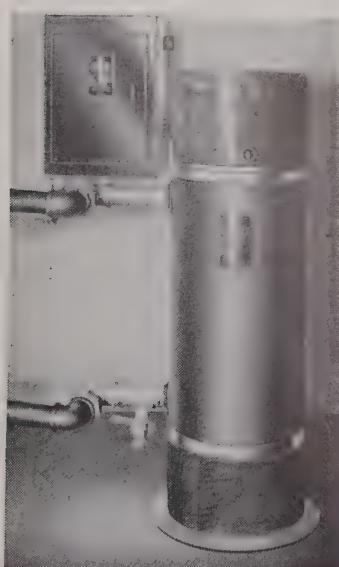
#### HEATOVENT (E2)

Domestic and industrial heating equipment. The range of "Tuvec" electric heating equipment for domestic and industrial applications includes convector heaters, panel heaters, air-warmers, fan heaters and flameproof and radiant units.

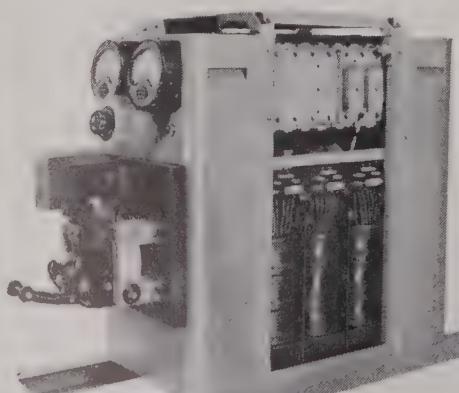
*Heatovent Electric, Ltd., Lomond Street, Glasgow, N.Z.*

#### HEATRAE (M4)

Water and space heating equipment. The Lido "Express" automatic sink water heater shown supplies up to 9 gal/hr of hot water and incorporates



Automatic electrode hot water boiler (H.V.E. (Electric), Ltd.)



Hirst Electronic 30 V  
2,000 A d.c. rectifier  
with reactor control for  
electrolytic plant

a visual current indicator. The Lido "Express Spray" is an automatic water heater which gives a continuous flow of water at hand washing temperature. The "Lidomatic" hot water system is being shown while a large

proportion of the display is devoted to electric fires and space heaters.

*Heatrae, Ltd., Norwich, Norfolk.*

#### F. C. HEAYBERD (J22)

Transformers, battery chargers and rectifying equipment. All rectifying units and battery chargers shown employ metal rectifiers. The first of a new range of industrial battery chargers and supply units for school laboratories is displayed.

*F. C. Heayberd & Co., Ltd., Greenwich South Street, London, S.E.10.*

#### HEDIN (M14)

Industrial electric heating equipment. Products shown include ovens, furnaces, elements and a new range of small capacity heat treatment ovens. Other products shown include humidity and low temperature environmental test cabinets for testing electronic components and cables under extreme climatic conditions. The cold cabinet is a new product and provides temperature cycles from -70°C to +150°C.

*Hedin, Ltd., Commerce Estate, South Woodford, London, E.18.*

#### HEENAN & FROUDE (WII)

Variable speed drives. The exhibits include a selection of "Ajustospede" and "Dynaspede" packaged variable speed drives and associated electronic control gear.

*Heenan & Froude, Ltd., Shrub Hill Road, Worcester.*

#### HELLERMANN (T5)

Plastic mouldings and extrusions, compression terminals and tools, cable accessories, spring-loaded terminal blocks, plugs and sockets, and communication equipment components. Compression terminals for cables from 7/0076 to 666/018 are available in two basic types, the "Twingrip" in which the terminal is compressed to the conductor and insulation simultaneously and "Wiregrip" in which the terminal is compressed to the conductor only. Other exhibits include elastic cable binding and marking sleeves, stripping and cutting wiring tools and cable clips. The range of "Suprafax" spring-loaded terminal blocks is on show, including a new twelve-way block rated at 10 A, 380/470 V. Connectors displayed include the HAN range of plugs and sockets and the "Bambi" miniature series, and there is also a display of sealing devices for pressure and water proofing cable connections.

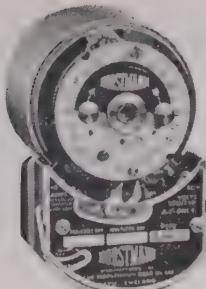
*Hellermann, Ltd., Crawley, Sussex.*

#### HENDREY RELAYS (Z3)

Relays, contactors, switches, meters and instruments. The exhibits include industrial and aircraft relays, contactors and control equipment, 26-way rotary, flameproof and special purpose switches, fire prevention equipment control apparatus, multi-channel impulse pen recorders, a mercury vapour



Recessed 60 W bulkhead lighting fitting  
(Holophane, Ltd.)



Horstmann Gear Co. type Q Mk. III time switch with solar dial



Herman Smith Smithlite "Albatross" coal effect fire

concentration meter, telemetry instruments including an angular accelerometer and an earth circuit test set.

*Hendrey Relays, Ltd., 392, Bath Road, Slough, Bucks.*

#### HEPWORTH IRON (W4)

Power cable jointing and underground cable conduits, troughing and joint boxes. The mechanical joint for power cables, in which the contact pressure is not dependent on the operator, is displayed. A new device is an earth continuity connector or temporary bond for cable jointers' use. The Clayware Division is showing a selection of underground cable conduits, troughing and joint boxes for power and telecommunication cables.

*The Hepworth Iron Co., Ltd., Hazelhead, nr. Sheffield.*

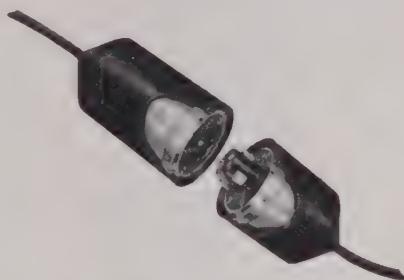
#### HERMAN SMITH SMITHLITE (U3)

Lighting fittings, busbar and distribution systems, cable trunking, infrared heaters and domestic electric fires. Cable tap systems, distribution boards, and fluorescent fittings designed to accept the "Smithlite" centre-contact lamp are included in the display and there is a new range of domestic electric fires being shown for the first time. The five fires in this range have a coal or log effect and are rated at 2 or 3 kW.

*Herman Smith Smithlite, Ltd., Empire Works, Dudley, Worcs.*

#### HILMOR (M5)

Hand- and power-operated conduit and pipe bending machines. A range of portable hand-operated and hydraulic machines are demonstrated bending up to 2in conduit. A power operated mandrel machine is demonstrated producing full bore transformer bends,



Harvey Hubbell "Hubbellock" armoured locking connectors

cold and unfilled, in 2in o.d. by 16g steel tube on a 4in root radius.

*Hilmor, Ltd., Caxton Way, Stevenage, Herts.*

#### HIRST ELECTRONIC (L12)

Saturable reactors for power control, welding machines, contactors, transformers and rectifiers. The main feature shows the application of saturable reactors for power control and examples from the range of reactors which extends up to 1,250 kVA, are on show. Other exhibits include a range of single pole contactors, and resistance welding instrumentation.

*Hirst Electronic, Ltd., Gatwick Road, Crawley, Sussex.*

#### HOLOPHANE (G6)

Industrial and commercial lighting fittings. Exhibits include industrial flameproof fittings with weatherproof features and heavy duty high-bay fittings. The "Widerlite" bulkhead range includes a model for use with the 50 W MBF lamp, and a recessed 60 W bulkhead fitting is shown for the first time. Other fittings on view include a 500 W reflector-bowl cast pendant, a vapourproof, dustproof and moisture-proof fitting for use with the 400 W MA/V and MBF/U lamps and 60 W vertical burning sodium lamps. In addition there are "Louvrelen" shop lighting fittings, fluorescent asymmetric lighting systems for control panels and the "Holoflux" range for offices and shops.

*Holophane, Ltd., Elverton Street, Westminster, London, S.W.1.*

#### HOMESHADE (R2)

Electric lamp chandeliers and wall brackets in both modern and tradi-

tional forms. In the traditional range are Bohemian crystal units from Czechoslovakia.

*The Homeshade Co., Ltd., 99, Baker Street, London, W.1.*

#### HONEYWELL CONTROLS (J1)

Domestic heating and humidity control equipment and micro-switches. A range of low and line voltage thermostats for electric heating control is displayed. Centralised control of up to ten electric heating zones may be obtained from the W489 "Weather Station," the facia of which contains dials showing time, indoor temperature and humidity, and outdoor temperature and barometric pressure. Switch exhibits include a newly introduced micro-switch for domestic appliances, a new range of two-way limit switches, a heavy duty foot switch and illuminated push-button switches.

*Honeywell Controls, Ltd., Greenford, Middlesex.*

#### HOOVER (S7)

Domestic appliances and fractional horse power motors.

*Hoover, Ltd., Western Avenue, Perivale, Middlesex.*

#### HORSTMANN GEAR (X7)

Hand and electrically wound time switches. The "Timestat" consists of a movement making one revolution in seven days and enables the switching requirements of each day to be individually programmed. Other switches include the 30 A 250 V a.c. type "V" Mark II model and the type "Q" Mark III model which can control two circuits each rated at 10 A, 250 V a.c. The type "EH" heavy duty time switch with a capacity of 50 A at 250 V a.c. or 25 A d.c. is shown, together with flasher units for beacon lights at crossings and an "Auto Timer" for domestic appliances.

*The Horstmann Gear Co., Ltd., Newbridge Works, Bath, Somerset.*

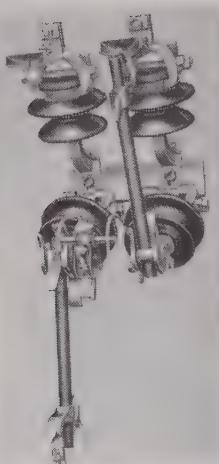
#### HUNT (CAPACITORS) (NI)

Capacitors of the electrolytic, metallised paper or film, foil and paper, stacked or silvered mica, and ceramic types for a wide range of applications including motor starting and running, power factor improvement, fluorescent lighting, induction heating and interference suppression.

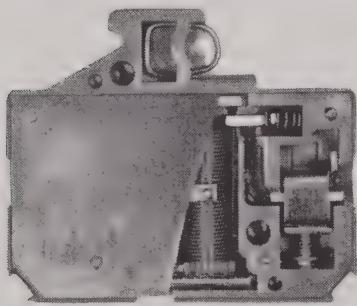
*A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18.*

#### HUNTON (P9)

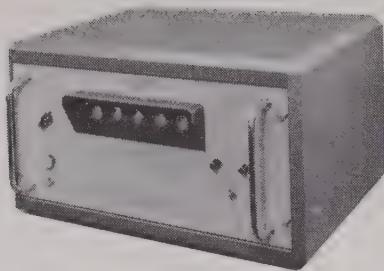
Sheet metal pressing equipment and eyeletting and light piercing machines. Ranges of round punches, dies and tools for standard chassis cut-outs, louvres, notches, etc., are available. A range of "Phoenix" eyeletting and light piercing machines is shown together with the range of "Whitney" machines which includes the portable



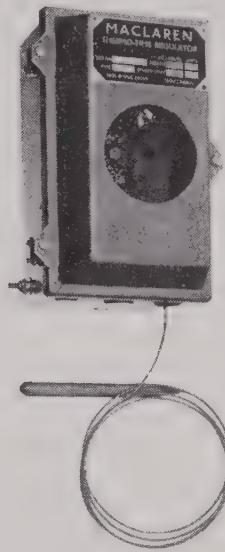
Johnson & Phillips type  
"D" fuse-switch repeater unit



Klippon Electricals type SAKL compensating terminal



J. Langham Thompson frequency meter



Robert Maclaren type "TC" thermo-time regulator



Heavy duty "Breeza" fan (London Fan & Motor Co., Ltd.)

Division are illustrating the use of "Melinex" polyester film and "Fluon" p.t.f.e. with particular reference to their electrical insulation properties, thermal and chemical resistance.

*Imperial Chemical Industries, Ltd. (Metals Division), Kynoch Works, Witton, Birmingham, 6.*

*(Nobel Division), Silicone Department, Stevenson, Ayrshire.*

*(Plastics Division), Welwyn Garden City, Hertfordshire.*

#### INDUSTRIAL TAPES (F20)

Pressure sensitive tapes for coil winding, motor winding, etc., high temperature insulating materials, pressure sensitive materials and aids for printed circuit work.

*Industrial Tapes, Ltd., Speedfix House, 19-23, Featherstone Street, London, E.C.1.*

#### I.E.E. (07 & 08)

The various activities of the Institution of Electrical Engineers, including those concerned with education and training, are featured on this stand. There is also a display of the Institution's publications.

*The Institution of Electrical Engineers, Savoy Place, London, W.C.2.*

#### INSULOID MFG. CO. (ZII)

Wiring accessories. Products shown on this stand include the "Cradlegrip" wiring system, the "Plasklip" non-metallic cable grip, adjustable saddles, cable ties and anchors, "Flexiguard" cable trunking and busbar insulation.

*The Insuloid Mfg. Co., Sharston Works, Leestone Road, Wythenshawe, Manchester.*

#### INTERNATIONAL RECTIFIER CO. (Y10)

Silicon and selenium rectifiers. The "Super Power" high voltage rectifier column shown delivers 9 A at 70 kV for radar applications. Individual diodes shown have ratings from 250 mA to 250 A in both the glass to metal sealed and the newer "Quad-Sealed" devices. High voltage rectifiers are shown in ceramic cases. Other silicon devices include solar cells, controlled rectifiers, zener diodes, zener voltage

No. 20 punch with a capacity of  $\frac{1}{2}$  in diameter holes through  $\frac{1}{2}$  in thick iron.

*Hunton, Ltd., 114-116, Euston Road, London, N.W.1.*

#### HURSEAL (PII)

Oil-filled domestic heating equipment. The principal feature of this stand is an oil-filled electric panel radiator in curved form, tailored to fit the full window width of a semi-circular bay window. Oil-filled radiators which can be fitted with a new double pilot light thermostat, combined towel rails and radiators, and the new Universal "U" towel rail are also shown.

*Hurseal, Ltd., 229, Regent Street, London, W.1.*

#### H.V.E. (ELECTRIC) (Q2)

Domestic and industrial floor heating, panel and fan heaters, electrode hot water boilers and a packaged central heating unit.

*H.V.E. (Electric), Ltd., Viaduct Works, Kirkstall Road, Leeds, 4.*

#### ILFORD (R4)

Photographic materials and dyeline printing machinery. The "Azoflex" dyeline printing machinery shown is suitable for all forms of document and plan copying. A new "Ninety-Ninety"

fast dyeline printing paper is being introduced at the exhibition.

*Ilford, Ltd., Ilford, Essex.*

#### IMHOFF (Z12)

Instrument housings and chassis. Some new additions to their range of instrument housings and accessories are shown together with specimens of standard cases and accessories including handles.

*Alfred Imhoff, Ltd., 112/226, New Oxford Street, London, W.C.1.*

#### IMPERIAL CHEMICAL INDUSTRIES (T13)

Metals for electrical and nuclear applications, and plastics. The Metals Division are showing copper, brass and aluminium in sheet, strip, extrusion and wire form together with titanium for electroplating and cathodic protection. Nuclear metals and other products for nuclear engineering are also shown. The Nobel Division exhibits comprise new and improved silicone products including "Silcoset" room-temperature-curing silicone rubbers for potting, encapsulation, sealing and caulking. Self-bonding pastes for silicone/glass for insulation, an impregnating resin and an adhesive resin for bonding silicone products and coating resistors are also shown. The Plastics

reference elements and complete rectifier stacks. The range of selenium rectifiers shown includes the new low priced radio and television stack and the standard range of plates having outputs from 200 mA up to 13 A per plate (half-wave rating).

*The International Rectifier Co. (Great Britain), Ltd., Hurst Green, Oxted, Surrey.*

#### LOCO (X8)

Laminated plastics and electrical insulating cloths and tapes (cotton, silk, nylon, Terylene, glass-base).

*Loco, Ltd., Netherton Works, Anniesland, Glasgow, W.3.*

#### IRISH CABLES (R6)

*See Wandleside Cable Works, Ltd. Irish Cables, Ltd., Newcastle, Co. Down, Northern Ireland.*

#### ISOPAD (K9)

Electric heating tapes, under-carpet heaters, and induction heaters. A new development in the range of Isopad electric heating tapes shown uses a metal sheathed mineral insulated heating element on a stainless steel mesh carrier. This is suitable for operating up to 650°C.

*Isopad, Ltd., Barnet By-pass, Boreham Wood, Herts.*

#### JEARY ELECTRICAL (K4)

The industrial electrical equipment shown includes geared and ungeared f.h.p. motors, fans including flame-proof versions, motor control gear, time switches and process timers.

*The Jeary Electrical Co., Ltd., 132-142, East Road, London, N.1.*

#### RICHARD JOHNSON & NEPHEW (K16)

Wires for the electrical trades, including steel and copper wires and strand, steel-cored aluminium, other composite conductors and copper strip.

*Richard Johnson & Nephew, Ltd., Forge Lane, Manchester, 11.*

#### JOHNSON & PHILLIPS (J13)

High voltage switchgear, transformers and cables. The type D expulsion fuse-switch, now certified for 150 MVA at 11 kV, and a new type of repeater fuse unit are prominently displayed. Other exhibits include air-insulated and compound-filled metal-clad gear incorporating the type PDB circuit-breaker, the type NX non-extensible ring main unit and the type SX oil switch. Both the oil switches are fitted with manual spring-operated mechanisms. A 5 MVA transformer core and winding and a 750 kVA TI transformer represent this company's products in this field. The capacitors on display demonstrate the benefits of power factor improvement, while a selection of main, wiring, control and special purpose cables are also shown.

*Johnson & Phillips, Ltd., Charlton, London, S.E.7.*

#### JONES AND STEVENS (HI)

Shaded pole and capacitor motors and fans. New products on show are the type "S" range of square stack shaded pole a.c. motors and the "Super Minex" extractor fan. Other exhibits include variable speed motorised geared units, f.h.p. motors and laboratory stirrers with mechanical stepless variable speed control.

*Jones and Stevens, Ltd., P.O. Box 35, Eastern By-pass, Littlemore, Oxford.*

#### WALTER JONES (W10)

Rotating machines. The range shown includes servo motors, frequency changers, rotary transformers, synchronous and induction motors, geared units, motor-driven geared interruptors for sending complex repeating pulse trains, d.c. motors and generators, hand generators, tachometer generators, speed governors, power and audible frequency alternators, etc. New products on view are a range of 2½ in diameter motors with and without gearhead, and servo two-phase, induction, synchronous and hysteresis motors. A 2½ kW 1,000 c/s motor-generator with a static control unit and a 50 c/s two-phase servo motor with silicon rectifier control are demonstrated.

*Walter Jones & Co. (Engineers), Ltd., Charlton Works, 36, Newlands Park, Sydenham, London, S.E.26.*

#### KENNION, IRVINE (PI6)

Tools for transmission line construction, and laminated and densified wood. "Chance" transmission line construction accessories, including "hot-line" tools are featured. Other exhibits include machined components in laminated and densified beechwood; "Resarm" is fully impregnated with synthetic resin and can be used either in air or under oil while "Transformer-wood" is unimpregnated and is for use under oil. Other products shown include wood pole transmission line stay-wire insulators and railway insulating fishplates.

*Kennion, Irvine & Co., Ltd., 75, Victoria Street, London, S.W.1.*

#### KENT BROS. (H3)

Insulated winding wires and strips.

*The Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd., Kew Works, Broad Lane, Bracknell, Berks.*

#### KLAXON (NI0)

F.h.p. motors, geared units, hooters, horns, and sirens. Industrial f.h.p. motors, synchronous motors and a.c. induction motors in a wide variety of frame sizes are shown. Flameproof enclosures are available in limited outputs. Other products include motor driven signals, including marine horns, air signals, industrial buzzers, hooters and various other ironclad and flame-proof signals.

*Klaxon, Ltd., 189-191, Drummond Street, London, N.W.1.*

#### KLIPPON ELECTRICALS (Q4)

Terminals. The products shown include control gear terminals, micro-terminals, terminal strips and special terminals for testing and measuring. The instrument terminal type SAKL has a stepless adjustable resistance to compensate for differences between the actual external resistance and that for which the instruments are calibrated. Control and switchgear terminals from 15 to 600 A are shown. The shock- and vibration-proof properties of these terminals are demonstrated and a continuous pull-out test is being carried out. A demonstration set illustrating the balancing terminal type SAKL is shown working with a thermocouple.

*Klippon Electricals, Ltd., Terminal Works, Power Station Road, Sheerness, Kent.*

#### H. KUHNKE (Y1)

Relays and solenoids of various types and constant voltage transformers are being exhibited.

*H. Kuhnke, Ltd., 163, Stanwell Road, Ashford, Middlesex.*

#### LABORATORY EQUIPMENT (S15)

Laboratory equipment including the products of Weyco (Equipment), Ltd., and other firms. The main exhibits are an automatic climatic cabinet, a "Universal" climatic cabinet which will operate from -10 to +70°C, the "Airflow" laboratory oven, a cold test cabinet to operate between +20 and -40°C and a heavy duty stirrer.

*Laboratory Equipment (London), Ltd., 18-20, Dames Road, London, E.7.*

#### LANCASHIRE DYNAMO & CRYPTO (E7)

Motors and generators. The principal exhibits are a 25 kW Ward Leonard motor-generator set with a 40 h.p. S.C.R. motor and a 3 kW exciter, a drip-proof 30 h.p. motor with fabricated steel carcass and class "H" insulated windings, a vertical spindle high torque "Pan-cake" motor rated for an intermittent duty cycle, a two-speed single winding 70/30 h.p. 980/735 r.p.m. amplitude modulated induction motor and a revolving-field 562 kVA alternator with a self-regulating static exciter in a separate cubicle. Examples from the range of small equipment include a self-contained brake demonstrated on 3 h.p. and f.h.p. motors, interpolar d.c. f.h.p. motors suitable for speed variation by shunt or armature voltage control up to 0-3,000 r.p.m., flameproof "Fankuld" motors, and ranges of d.c. and a.c. motors and geared motor units.

*Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester, 17.*

#### LANCASHIRE DYNAMO ELECTRONIC PRODUCTS (A2)

Industrial electronic control equipment. A display of drives shows the application of silicon control rectifiers

and transistors for both static and motor-generator speed controls. Also on view is a range of resistance welding control equipment, continuous bin level measuring apparatus and an automatic feed control designed to maintain a constant mill motor loading by regulating the speed of the input material feed conveyor.

*Lancashire Dynamo Electronic Products, Ltd., Rugeley, Staffordshire.*

#### LANCASHIRE DYNAMO NEVELIN (E7)

Control cubicle using type M.K. contactors, a 200 h.p. variable speed drive and 800 A flush and projecting type HI switches.

*Lancashire Dynamo Nevelin, Ltd., Hurst Green, Oxted, Surrey.*

#### J. LANGHAM THOMPSON (J26)

Oscilloscope recording cameras and photographic equipment, electronic measuring instruments, voltage regulating equipment, power supply units and electronic equipment encapsulation. A microscope recording camera and an automatic film processor are shown and electronic measuring instruments featured include digital counting equipment, indicator units for use with strain gauge transducers, thermocouples and potentiometer transducers, a 20 kc/s transducer carrier system for use with high-speed galvanometer recorders and a liquid flow meter. A potentiometer accelerometer, a lead zirconate titanate transducer, displacement transducers and strain gauge load cells and dynamometers are shown together with a transistorised a.c. voltage regulator and d.c. power supply units.

*J. Langham Thompson, Ltd., Springfield Laboratories, Bushey Heath, Herts.*

#### LANGHAM TOOLS (S2)

"Combi" vibratory concrete drills, the "Baier" portable circular saw for ferrous and non-ferrous metals, "Westa" chasing tools and cartridge operated tools for fixing "Gemofix" bolts into building materials.

*Langham Tools, Ltd., 19, Margaret Street, London, W.1.*

#### LANGLEY LONDON (J3)

Mica based and laminated plastic insulation materials. The various steps in the manufacture of these insulation materials and typical examples of finished products and their applications are shown.

*Langley London, Ltd., Kelvin Way, Crawley, Sussex.*

#### LAURENCE, SCOTT & ELECTRO-MOTORS (N11)

Speed control systems, motor control gear and variable speed a.c. motors. A working exhibit compares two systems of motor speed control. The "Velonic" system uses electronic valves and will shortly be available with

semiconductors, and the "Asmag" uses a magnetic amplifier. A typical example of the centralised draw-out motor control gear shown allows each control panel to comprise either eight 12½ h.p. and one 35 h.p. units, five 35 h.p. units, three 90 h.p. units, or equivalent combinations. A representative range of standard N-S variable speed a.c. motors is shown. Motors developed for special requirements which are on view include a water-cooled submersible pump motor for a nuclear plant, a motor for a planing machine/plano-mill conversion, a torque motor for valve operation and a large d.c. split-field pilot motor of low inertia and fast response.

*Laurence, Scott & Electromotors, Ltd., Norwich, NOR. 85A.*

#### LEE GUINNESS (RII)

Motor control gear and contactors. In addition to a range of industrial and marine motor control gear with starters of the direct-on-line, star-delta, auto-transformer and the "Vapormatic" step-less slip ring types for motors from 1 to 300 h.p., the exhibits include contactor gear with ratings from 10 to 1,200 A.

*Lee Guinness, Ltd., Newtownards, Northern Ireland.*

#### LEWDEN METAL PRODUCTS (E3)

Wiring accessories. The products on view include switch boxes, plugs and indicator pilot units from 5 to 15 A, weather-tight switches, switch plugs and cable couplings up to 15 A, sockets and plugs from 2 to 30 A and 5 A plug adaptors and tee couplings. Also on view are packing glands, flexible tubing adaptors, armoured cable glands and flexible arm lamps.

*Lewden Metal Products, Ltd., 5, Argall Avenue, Leyton, London, E.10.*

#### LIGHT & POWER ACCESSORIES (K25)

Wiring accessories and distribution systems. Shown on this stand is a range of industrial, weatherproof, watertight and submersible plugs, sockets, switches, switch-sockets, and cable terminations ranging from ½ to 350 A capacity. Also on view is a display model illustrating the layout of a mobile light and power distribution system.

*The Light & Power Accessories Co., Ltd., Wellesley Works, Wellesley Road, Wood Green, London, N.22.*

#### LINE EQUIPMENT (T5)

High voltage outdoor switchgear and fuses.

*Line Equipment, Ltd., 71a, Queen Victoria Street, London, E.C.4.*

#### LINTON & HIRST (T8)

Transformer cores and core laminations, including miniature laminations in silicon irons, grain orientated material

and nickel alloys. In addition toroidal cores are on view.

*Linton & Hirst, Ltd., Lam Works, Palmerston Road, Wealdstone, Harrow, Middlesex.*

#### LONDEX (G8)

Relays, timers, level controls, pressure and vacuum switches and a power factor regulator. Electromagnetic relays of the multiple contact, mercury switch, miniature, telephone, double-action, latching, coaxial and plug-in types are on view. A selection of process timers and a range of pressure and vacuum switches is shown, while new items include the types LC and BC contactors with moulded one-piece contact carriers and rated up to 20 A 250 V a.c.; a miniature hopper switch for the level control of free flowing materials; a magnet operated switching device; a miniature pressure switch and an automatic power factor regulator for h.f. induction heating plants.

*Londex, Ltd., 207, Anerley Road, London, S.E.20.*

#### LONDON ELECTRIC WIRE & SMITHS (LS)

Insulated wires and strips. This company is showing "Lewcos" insulated wires and strips including "Lewmex," "Lewcoglass," "Lewkanex," "Lewcosol" and "Lewbestos" conductors. Also shown are samples of transposed strip and a range of "Superfine" self-fluxing wires for miniature windings.

*The London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.*

#### LONDON FAN & MOTOR (P7)

Ventilating equipment. On view is a selection from the range of "Breeza" fans, glass fibre and sheet metal roof units, fan coolers, kitchen ventilators, paddle blade fans, blowers, multivane fans and ancillary equipment.

*The London Fan & Motor Co., Ltd., 331, Sandycombe Road, Richmond, Surrey.*

#### LONDON TRANSFORMER PRODUCTS (L2)

Class C and H transformers for special requirements, and air- and oil-cooled transformers for distribution, instrumentation, and machine tools are shown in addition to current transformers, frequency operated stabilisers and rectifier transformers for control equipment.

*London Transformer Products, Ltd., Cobbold Estate, Willesden, London, N.W.10.*

#### LONG & CRAWFORD (T7)

Medium and high voltage switchgear. The exhibits include indoor and outdoor switchgear for service up to 11 kV including oil circuit-breakers, oil switches, fuse switches and ring main units. High speed auto-reclose circuit-breakers for 250 MVA at 6·6 and 11 kV

are also shown. New products include a type WLD outdoor circuit-breaker for overhead line connection, having built-in isolators and earthing facilities.

*Long & Crawford, Ltd., 200, Gorton Road, West Gorton, Manchester, 12.*

#### LORD'S CONTROLS (XI)

Control and indication equipment including examples for automatic mains failure units. There is also a range of new single-, two- and three-light indicator and alarm units.

*Lord's Controls, Ltd., 15, Victoria Avenue, Camberley, Surrey.*

#### LUCY (XII)

Outdoor "package" substation and switchgear. Shown for the first time at this exhibition is a complete outdoor "package" substation consisting of a 500 kVA transformer with an 11 kV oil immersed ring main unit mounted directly on to the h.v. flange and an l.v. feeder pillar similarly mounted on the l.v. flange. Other exhibits include underground disconnecting boxes and a 17-way Mk. III cubicle type m.v. fuse switchboard complete with a 1,200 A air circuit-breaker and a 300 A contactor, current transformers, maximum demand indicators and rotary selector switches. A display panel is used to show house service and street lighting cut-outs both in bakelite and glass fibre, heavy duty cutouts, cable boxes, and contactors.

*W. Lucy & Co., Ltd., Eagle Ironworks, Oxford.*

#### LUMITRON (Z5)

Illuminated suspended ceiling, display spotlights and fluorescent fittings. A suspended ceiling erected at eye level demonstrates the design and method of fixing.

*Lumitron, Ltd., 180, Shaftesbury Avenue, London, W.C.2.*

#### LUPUS ELECTRICAL PRODUCTS (F1)

A new 1 kW version of the "Electri-kindler" electric fire lighter shown, can ignite both coal and most smokeless fuels.

*Lupus Electrical Products, Ltd., Lupus Works, Oxford Road, Altrincham, Cheshire.*

#### ARTHUR LYON (J25)

Alternators and motor driven pumps. The type E.S. alternator both in standard form and fitted with an electronic voltage regulator is demonstrated. There is also a sectional model of the "Stamford" L-range alternator showing the simplicity of the static excitation and control gear. New products include the range of "Stamford" marine alternators, the series II range of E.S. alternators including new frame sizes and typical examples of the "Alcon-Thames" range of motor driven centrifugal pumps.

*Arthur Lyon & Co. (Engineers), Ltd., Park Works, Stamford, Lincs.*

#### W. MACKIE (X4)

Rotating machines and control gear. Included in the exhibits on this stand is a selection of d.c. and a.c. radar power supplies for shipboard use, rotary transformers, rotary invertors, f.h.p. motors, dynamotors, pulsing machines, 15 kVA 400 c/s motor-generator, 5 kVA 400 c/s vertical brushless type motor-generator, magnetic amplifier type voltage regulators, transistorised regulators and a static inverter with an input of 24/32 V d.c. and an output of 250 W single-phase.

*W. Mackie & Co., Ltd., 129-133, Lambeth Road, London, S.E.1.*

#### ROBERT MACLAREN (H21)

Temperature control equipment and micro switches. The new type TC version of the "Thermo-Time" regulator shown has a thermostatically sensitive medium, a capillary and bulb and the standard version is fitted with an electric synchronous clock motor. The instrument controls automatic building heating systems to a temperature-time programme. The hand reset thermal cutout type KA introduced at the exhibition provides overheat protection of both domestic and industrial equipment. Another new product is a miniature micro-switch, type MM, and other exhibits include the type TA thermo-time regulator.

*Robert McLaren & Co., Ltd., Eglinton Works, Kilbirnie Street, Glasgow, C.5.*

#### MAGICOOK APPLIANCES (Q6)

Domestic and commercial cookers and domestic and industrial electric heaters. The "Magicook" de-luxe infra-red domestic cooker is being shown together with the "Princess" infra-red grill with automatic heat control. Infra-red grills for the catering trades and a new 1½ kW deep fryer with thermostat control are also shown. Other products displayed include the 2½ kW "Magicair" fan heater, the 2 kW "Popular" fan heater and the industrial 3 kW fan heater. New items shown include the "Magicair" "Supreme" 2 kW fan heater, the "Magicair" hood hairdryer, a 3 kW coal effect fire with the new "Air Rola Fan Unit" giving three stages of heat and two fan speeds and a 1 kW portable skirting type convector heater.

*Magicook Appliances, Ltd., 115/129, Carlton Vale, London, N.W.6.*

#### MAGNETIC & ELECTRICAL ALLOYS (H6)

Silicon and nickel iron laminations and stampings are displayed, with magnetic shielding boxes and screens. A new inter-lamina insulation "Inlac" is shown.

*Magnetic & Electrical Alloys, Ltd., Burnbank, Hamilton, Lanarkshire, Scotland.*

#### MAGNETIC DEVICES (W12)

Relays, solenoids, connectors and rotary transformers. The relays displayed include the new types of

enclosed and hermetically sealed multi-pin plug-in relays and printed circuit relays for the standardised DIN grid. A range of solenoids suitable for use in computers, office machines and light electro-mechanical equipment is also displayed. Other products shown include connectors, multi-pin plugs and sockets, printed circuit connectors and rotary transformers.

*Magnetic Devices, Ltd., Newmarket, Suffolk.*

#### MAJOR EQUIPMENT CO. (H2)

Lighting dimmers, stage lighting equipment, fluorescent fittings and cold cathode and neon lighting. Remote control auditorium dimmers, resistance dimmers, choke type dimmers and dimmer boards are displayed. The stage lighting equipment shown comprises battens, floods, spots from 250 to 1,000 W in both standard and high power double mirror types, and a new 2 kW spot. An automatic power input controller for programme operation is also exhibited, while the fluorescent fittings displayed include a triple-tube unit for continuous store lighting and a bulkhead triple-tube fitting.

*The Major Equipment Co., Ltd., 22, Gorst Road, London, N.W.10.*

#### MANTEL METALWORKERS (J11)

Rising mains, consumers' electricity supply control unit, meter cases, cable trunking and cases. The rising main systems featured include a lightly insulated copper rod system for 300 and 600 A rating and a hard copper system from 400 to 700 A. For industrial installations, the "Zedlok" and "Springlok" cable trunkings are also featured.

*Mantel Metalworkers, Ltd., 121, Gurney Street, Walworth, London, S.E.17.*

#### MARBOURN (D10)

Wiring accessories. An improved 13 A "Marbo" fused plug with three block type terminals is being shown. A new product is the range of "Plusflex" assemblies for 13 A flat pin plugs and socket outlets. Each assembly has three or six yards of 70/0076, three-core flexible cord with a shuttered connector and standard 13 A fused plug. The connectors are also available as a separate item.

*Marbourn, Ltd., Roslyn Works, Roslyn Road, South Tottenham, London, N.15.*

#### MARRYAT & PLACE (D12)

Distribution busbar systems. The "Barduct" triple-pole and neutral busbar distributor is available in 150 or 250 A ratings, supplied in standard sections with accessories for jointing into continuous runs. Tappings are made by h.b.c. fused connection boxes plugged in as required to the outlets provided. The "Metal Clad" busbar equipment shown is available in ratings up to 1,350 A.

*Marryat & Place, Ltd., 40, Hatton Garden, London, E.C.1.*

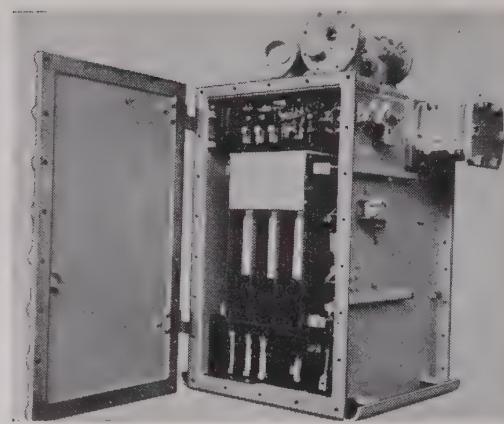
**MARTINDALE ELECTRIC (B1)**

Portable blowers, heater units, voltage and continuity testers. The new voltage indicator has a dial containing four neon tubes which light progressively as the voltage rises. This instrument is suitable for use in the 50–600 V range on d.c. or a.c. of most frequencies. Another new product on display is the phase and continuity indicator which has five neon tubes arranged in two rows, the top three tubes indicating continuity and the lower two indicating the direction of phasing.

*The Martindale Electric Co., Ltd., Westmorland Road, London, N.W.9.*



Measuring Instruments (Pullin)  
miniature edgewise voltmeter



M. & C. Switchgear 3.3 kV flameproof starter for  
250 h.p. motor

**MAWDSLEY'S (W2)**

Rotating machines including motor-generator sets. The new variable speed reversible a.c. motor shown has a speed range from 0 to 3,000 r.p.m. with a constant torque. Full-load starting torque is exerted with only 30 per cent full-load current and regenerative braking is an inherent feature. Other variable speed d.c. or a.c. motors are represented in this display, with a.c. brake motors, package unit Ward Leonard sets and a 22 kVA motor-generator set.

*Mawdsley's, Ltd., Dursley, Gloucestershire.*

**M.B. METALS (P19)**

See Nobrac Carbon, Ltd.

*M.B. Metals, Ltd., Portslade, Sussex.*

**M.B. PACKAGING (P19)**

See Nobrac Carbon, Ltd.

*M.B. Packaging, Ltd., Lancing, Sussex.*

**M. & C. SWITCHGEAR (K7)**

Switch and control gear. New products shown include "Unicube" starter boards with draw-out starters up to 100 h.p. and flameproof starters up to 100 h.p. for both individual mounting and board formation. Other products shown include a comprehensive range of starter and distribution units for building into board formation and individual contactor starters which are available up to 300 h.p. in the 380/650 V range and up to 250 h.p. in the 3.3 kV range.

*M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.*

**M.C.B. CO. (F1)**

Miniature circuit-breakers. "Lupus" Senior and Midget miniature circuit-breakers (m.c.b.) and distribution boards are being shown. The m.c.b.s cover a range from 0.75 A to 60 A and are available in single-, double- and triple-pole types. The Midget circuit-breaker has facilities for cable entry, busbar fixing, plug-in mounting and backstud connection by simple adaptors. Distribution boards with single-, double- and triple-pole m.c.b.s are also exhibited. New products include an m.c.b. distribution

board containing circuit-breakers of up to 400 A rating. Standard distribution boards have now been adapted for use with triple-pole units, using the plug-in principle.

*The M.C.B. Co. (Manchester), Ltd., Lupus Works, Oxford Road, Altrincham, Cheshire.*

**WILLIAM MC GEOCH (E10)**

Watertight plugs and sockets, lamp-holders, knife-switches, lighting fittings and bakelite mouldings. Among the watertight plugs and sockets, switches and couplings shown are multi-pin sockets and plugs. Miniature heat resistant multi-pin plugs and sockets rated at 2-5 A are available with up to 154 pins. A new indicator light fitting for panels up to  $\frac{1}{2}$  in thick is on show. Other products exhibited include brass and porcelain b.c. lampholders, knife-switches up to 10,000 A, fusegear up to 400 A, and watertight, weather-proof and decorative lighting fittings.

*William McGeoch & Co., Ltd., Warwick Works, Bordesley, Birmingham, 10.*

**MEASURING INSTRUMENTS (PULLIN) (J27)**

Switchboard, miniature and portable instruments, test sets and relays. The on/off controller shown uses a conventional moving coil instrument movement with a flag at the pointer tip to interrupt a light beam directed on to a photo-transistor. The output of the transistor operates a relay connected into the circuit to be controlled. The portable industrial thermometer exhibited is designed to give a rapid reading of any surface, liquid or gas temperature using a small probe connected to an indicating instrument with its own battery power supply.

*Measuring Instruments (Pullin), Ltd., Electrin Works, Winchester Street, Acton, London, W.3.*

**MERSEY CABLE WORKS (H15)**

Industrial and wiring cables. These include p.v.c. insulated mains cables and control cables for power distribution, colliery cables, railway signalling and special heating cables, rubber and

plastic insulated cables for industrial purposes, "Merad" irradiated polythene insulated equipment wires, and telephone distribution and switchboard cables.

*Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool, 20.*

**METAL & ARTS (W3)**

Decorative and domestic lighting. Contemporary lighting fittings in decorative glass and larger fittings suitable for public rooms are shown.

*The Metal & Arts Co., Ltd., 26, Newman Street, London, W.1.*

**METWAY (N12)**

Wiring accessories, heating elements and domestic appliances. Samples of terminal blocks and industrial and domestic heating elements are displayed. New products shown include the clockwork timed "Turnover Toaster" and an electric hand dryer. Other exhibits include fires, irons, kettles, and ceiling, desk, and extractor fans.

*Metway Electrical Industries, Ltd., Metway Works, Canning Street, Brighton, 7.*

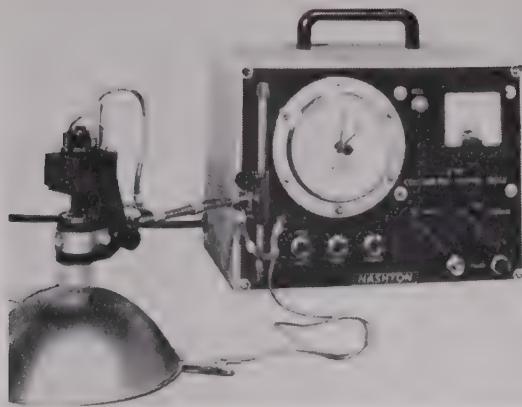
**MICANITE & INSULATORS (T2)**

Electrical insulating materials. The displays feature the principal types of mica insulation; natural mica, "Micanite" (built-up mica) and "Samica" (a mica paper). Paxolin synthetic resin bonded laminates, silicon insulation, Empire varnished materials, and thermoplastics are also shown.

*The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17.*

**MIDLAND ELECTRIC MANUFACTURING (D6)**

Low and medium voltage switchgear and motor control gear. Switch and fusegear for domestic and industrial installations on show includes the recently introduced ranges of "Memrex-Exel" and "Exel" 500 V gear with sheet steel enclosures and front operating switch handles, "Glasgow-Rex" and "Glasgow-Exel" switches



B.N.F. Coulometric plating gauge shown by the Mond Nickel Co., Ltd.

and fuse-switches, and "Kantark-Exel" fuse-boards. Motor control gear includes protective equipment for all motors from  $\frac{1}{4}$  to 25 h.p. and direct starting, star-delta and reversing gear arranged for push-button or manual operation. Electrical accessories include new fireside and bedside multiple socket outlets.

*The Midland Electric Manufacturing Co., Ltd., Reddings Lane, Tyseley, Birmingham, 11.*

#### WILLIAM MILLER (Q1)

Domestic and industrial ventilating equipment. Window and wall fans in the "Controlaire" 6, 8 and 10in range are on view. New this year is a range of industrial fans from 12in to 18in sizes.

*William Miller (Newcastle), Ltd., Railway Terrace, Newcastle-on-Tyne, 4.*

#### MILLETT LEVENS (L5)

Self-adhesive and conventional industrial nameplates, dials and scales in metals and plastics.

*Millett Levens (Engravers), Ltd., Barnet Bypass, Stirling Corner, Boreham Wood, Hertfordshire.*

#### MINERVA MOULDINGS (E4)

Miscellaneous compression mouldings in bakelite, etc.

*Minerva Mouldings, Ltd., Raans Road, Amersham, Bucks.*

#### MINNESOTA MINING (R3)

Electrical tapes, pipe protection, a cable jointing system and spring connectors. "Scotch" brand electrical tapes with thermosetting adhesives or thermoplastic adhesives have paper, polyester film, acetate film and cloth, p.v.c. or glass cloth backing. Also available are high temperature p.t.f.e. adhesive tapes. Other exhibits include the "Scotchrapp" tapes for pipe protection and the "Scotchcast" cable jointing system using resin. New products include a range of "Scotchloks" electrical spring connectors.

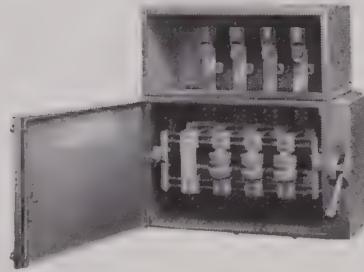
*The Minnesota Mining & Mfg. Co., Ltd., 3M House, Wigmore Street, London, W.1.*



*Martindale phase and continuity tester*



*M.C.B. Lopus "Midget" eight-way single-pole and neutral distribution board*



*Midland Electric Manufacturing "Glasgow-Exel" 500-800 A four-pole flush mounting fuse switch unit*

required to pull a magnet off the surface of a plated article.

*The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1.*

#### MOON AIRCRAFT (Q7)

Lighting fitting reflectors and lamp covers.

*Moon Aircraft, Ltd., Clift Works, Box, Wiltshire.*

#### MORECAMBE ELECTRICAL (Y6)

Motor starting equipment. The selection of MXL starting equipments displayed includes direct-on-line, star-delta and stator-rotor units which can be supplied as individual starters or assembled into composite multi-motor boards. Also on view are weatherproof/dust-protected direct-on-line starters shown in operation under arduous conditions.

*The Morecambe Electrical Equipment Co., Ltd., Westgate Works, Morecambe, Lancashire.*

#### MORGAN COMPONENTS (H5)

Carbon components for the electrical industry.

*Morgan Components, Ltd., Cumberland Road, Stanmore, Middlesex.*

#### MORGAN CRUCIBLE (H5)

Carbon components for the electrical industry. The exhibits include "Morganite" carbon brushes and brush holders, metal-carbon and silver contacts, current collectors for tram and

railway pantograph bows and pans, "Morganite" and "Morganohm" heavy and light duty rod, tube and disc resistors and ultra high ohmic "Megistors." Also shown are "Cru-silite" electric furnace heating elements with temperature ranges up to 1,500°C and carbon valve anodes, bearings, seals, gland rings, and transistor jigs.

*The Morgan Crucible Co., Ltd., Battersea Church Road, Battersea, London, S.W.11.*

#### MORGANITE RESISTORS (H5)

See Morgan Crucible Co., Ltd.

*Morganite Resistors, Ltd., Bede Trading Estate, Jarrow, Co. Durham.*

#### MORPHY-RICHARDS (G16)

Domestic electrical equipment. The exhibits on this stand are the products of Morphy-Richards (Cray), Ltd., and their associated companies. Prominent on the stand is the newly introduced "Astral" table top model A.350 refrigerator which has a gross capacity of 3.5 cu ft. Other refrigerators include the 1.6 cu ft A.160 built-in model which can be fitted below a draining board or can be wall-mounted, the 2 cu ft table model A.200 and the 4 cu ft "Commodore" model. These refrigerators are fitted with thermostatically controlled absorption units. Also shown is the "Silavent" system for extracting polluted air from toilets, home laundry appliances including a rotary power ironer and a spin dryer, the "Bermuda" fan heater which has a two-speed fan and a 2 kW element which can be switched to half-heat and also the newly introduced VCA vacuum cleaner.

*Morphy-Richards (Cray), Ltd., 50, Conduit Street, London, W.1.*

#### M.T.E. CONTROL GEAR (K2)

Control gear, contactors, starters, relays, disc brakes and terminal blocks. A demonstration of control panel construction using the "Progress" range of control gear components is featured, together with a display of new additions to the range including automatic direct-on-line and star-delta starters suitable for motors from 1 to 75 h.p. A new development shown is a range of contactors for heating control applications. These are available in single-, double- and triple-pole form rated from 15 to 150 A. Also shown are "Discmag" electro-magnetic disc brakes, "Multi-lock" interlocking unit terminal blocks, contactors, thermal overload relays with single-phasing protection, magnetic overload relays, timing relays, oil-tight push-button units and custom-built control panels for machine tools and refrigeration plant.

*M.T.E. Control Gear, Ltd., Leigh-on-Sea, Essex.*

#### MULLARD (Z14)

Electronic equipment for power control, and semiconductor devices.

A new semiconductor device for power rectification is being demonstrated on this stand and a range of power and controlled semiconductor devices is on display.

*Mullard, Ltd., Mullard House, Tooting Place, London, W.C.1.*

#### NALDER BROS. & THOMPSON (GI)

Instruments and relays. In addition the movement of the world's largest moving-coil meter mounted on the first floor by the Warwick Road entrance, this company is showing new short scale moving-iron and moving-coil instruments, an air-cored electrodynamic wattmeter for d.c. and a.c. to 10 kc/s, and an electrostatic earth leakage relay for use on fully insulated systems. Portable and switchboard electrostatic voltmeters are displayed with a new contact-making electrostatic voltmeter. A special display covers the applications of the company's patented fluid damping system for instruments. A multi-outlet earth proving unit with separately mounted switch sockets for up to six portable tools is being demonstrated.

*Nalder Bros. & Thompson, Ltd., Dalston Lane Works, London, E.8.*

#### N.I.C.E.I.C. (O2)

The National Inspection Council for Electrical Installation Contracting is showing earth-loop impedance testing equipment by various manufacturers. There is also a display of wiring practices to comply with the I.E.E. Wiring Regulations, together with examples of common installation faults and how they may be eliminated.

*The National Inspection Council for Electrical Installation Contracting, Aldine House, 10-13, Bedford Street, London, W.C.2.*

#### NATIONAL PRESSURE COOKER (S6)

Cooking appliances. The aluminium cooking appliances shown have sealed elements cast in the base. Control is by an interchangeable plug-in "Control Master" giving thermostatically controlled pre-set temperatures up to 425°F. Also shown are the 11in square 1,150 W frypan, the cooker fryer and pressure cooker, each with a 1,300 W element, and the 17½in by 10in griddle hot plate with a 1,400 W element. A food mixer and coffee grinder are also shown.

*The National Pressure Cooker Co. (England), Ltd., Fort Works, Pelham Street, Wolverhampton.*

#### NETTLE ACCESSORIES (K11)

Domestic and industrial wiring accessories. The new 20 A double-pole control switch range for water heaters and other appliances is shown, also a new 45 A cooker control switch with 13 A socket, with or without neon indicator. A new range of plastic conduit boxes, connectors and joints are available while other products shown include two-way socket adaptors, a

13 A plug which has a fuse inspection panel, a switched lampholder range and a pendant control unit. Integrally moulded lampholders and cables, rubber clad cable couplers, and plugs and sockets are also exhibited.

*Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester, 22.*

#### NEWMAN INDUSTRIES (K12)

Squirrel cage and slip-ring induction motors. Exhibits include an example of the standard types of totally enclosed and drip-proof motors produced with ranges extending from ½ to 600 h.p. Special-purpose motors shown include flameproof, explosion proof, inverted induction and vertical types, solid and hollow shaft pumps, f.h.p. motors for oil burner and domestic appliances, close-coupled pump and brake motors. An example of epoxy encapsulation for all motor frames up to 125 h.p. is being displayed for the first time.

*Newman Industries, Ltd., Yate, Bristol.*

#### NEWTON BROS. (X12)

Rotating machines, transistor converters and voltage regulators. The products displayed include motor-generators, high speed motors, high frequency alternators (200-3,000 c/s), permanent magnet alternators, rotary transformers and converters, servomotor generators and other special designs of rotating machinery. Automatic carbon pile voltage and current regulators for generating sets or for stabilising voltage or current either from the mains or from a battery supply are also displayed. Another product shown is a d.c./d.c. transistor converter.

*Newton Brothers (Derby), Ltd., Alfreton Road, Derby.*

#### NIFE BATTERIES (G5)

Batteries, battery chargers and battery control equipment. The "Nife-O-Matic" switchgear unit displayed is designed for duties involving periodic intermittent discharges. Cells for railway signalling, automatic train control, and train lighting are displayed with cells for diesel-electric starting and traction duties. Cells supplied for marine applications are also shown. The stand lighting is protected by a "Nife-Neverfayle" Minor emergency lighting equipment, while portable safety lamps, inspection lamps and floodlights complete the display.

*Nife Batteries, Redditch, Worcs.*

#### NOBRAC CARBON (P19)

Carbon brushes for all types of rotating machines from small permanent magnet motors to heavy duty motors and generators. Hard carbon, electrographite, metal graphite mixtures, resin bonded carbons, brush holders and metal contacts, and a range of p.t.f.e.-carbon mixtures are shown. Products of associated companies

(Continued on page 481)

# HIGH FREQUENCY GENERATORS FOR INDUCTION HEATING

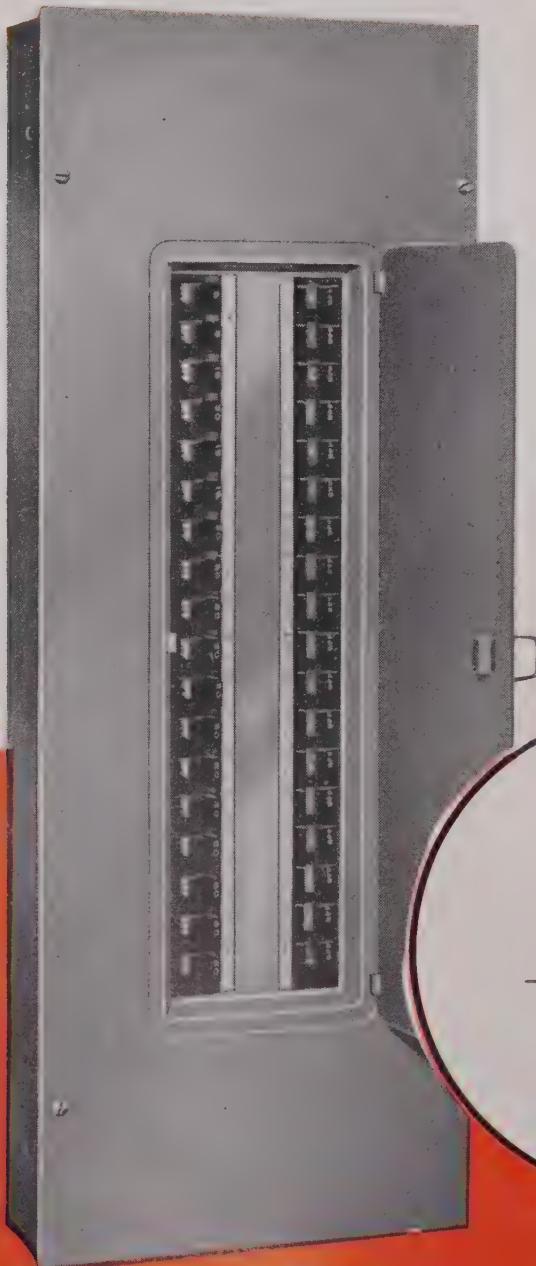


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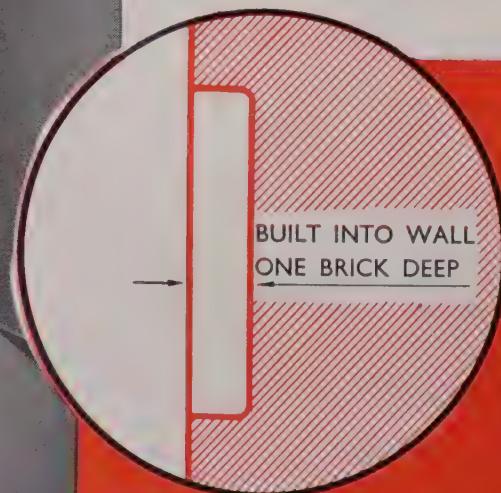
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shown include plug and socket connectors and pressure switch units.

*Nobrac Carbon, Ltd., Commerce Way, Lancing, Sussex.*

#### NORBURY WATCH (P14)

*See Gordon Miller, Ltd.*

*The Norbury Watch Co., Ltd., 91, Beddington Lane, Beddington, Surrey.*

#### NORTHERN POLYTECHNIC (O13)

The Department of Electronics and Telecommunications are showing laboratory work performed by students in each year of their course, culminating in the design and construction of a piece of electronic apparatus. Some experiments are being demonstrated and new instruments now in use are being shown.

*The Northern Polytechnic, Holloway Road, London, N.7.*

#### N.S.F., LTD. (X3)

Rotary and appliance switches, solenoids, relays and potentiometers. Switches exhibited include NSF-OAK rotary wafer types, NSF Cutler-Hammer appliance switches rated 1-20 A a.c. or d.c. NSF-Ledex rotary solenoids, circuit selectors and stepping relays, including a new miniature circuit selector are displayed together with NSF Union miniature, hermetically-sealed relays, and the NSF Centralab potentiometers. New products displayed include the NSF Cutler-Hammer "Rockette" range of slow make, slow break, rocker action appliance switches.

*N.S.F., Ltd., Ingrow Bridge Works, Keighley, Yorkshire.*

#### OTTER CONTROLS (TII)

Thermostats. The new manual reset safety cutout, for protecting fan heaters, convector heaters, and clothes dryers, being shown is rated at 13 A 250 V a.c. The contact pressure demonstration shows a type K Mk. IV thermostat operating with 1½ lb suspended from its moving contact. Other products demonstrated include the "Pup" auto reset safety cutout, the variable control thermostat type O Mk. V, and the type U Mk. I immersion thermostat.

*Otter Controls, Ltd., Otters 'Ole, Buxton, Derbyshire.*

#### OTTERMILL SWITCHGEAR (G14)

Low voltage switchgear and busbar trunking systems. The rising main busbar trunking system shown includes fire resisting barriers and expansion units. Associated distribution units incorporating h.b.c. fuse switches, miniature circuit-breakers and fuse distribution boards are displayed. Industrial switchboards complete with oil circuit-breakers and fuse switches are shown in addition to displays of oil circuit-breakers and industrial fuse switches.

*Ottermill Switchgear, Ltd., 82, Victoria Street, London, S.W.1.*

#### P. & B. ENGINEERING (M6)

Thermal relays, load indicators, maximum and minimum voltmeters, line taps and earthing equipment. This display includes P & B-Golds relays for motor protection, a new temperature sensitive relay developed to protect semiconductor rectifiers, new designs of live line taps and earthing clamps in light alloy, and an operating pole with integral head in glass fibre.

*The P.B. Engineering Co., Ltd., Crompton Way, Crawley.*

#### P. & R. ELECTRICAL (P12)

Infra-red equipment. A sealed ceramic element shown can be burnt in any position and is resistant to humidity, corrosion and chemical atmospheres. A new range of "Slim-Rad" domestic/commercial units contains three models in different lengths, wattages and colour range. The units can be used individually, and controlled by a separate pull switch unit fitted with neon warning light, or in a continuous run.

*P. & R. Electrical (London), Ltd., 1, Berrymead Gardens, London, W.3.*

#### PARMEKO (YII)

Transformers, transductors and magnetic amplifiers. Exhibits range from miniature transformers for transistor circuit applications to units up to 15 kVA 50 c/s with conventional and toroidal windings and resin cast, oil-filled and air cooled constructions. Transformers for high temperature applications are also displayed, also saturable reactors, transductors, mag-

netic amplifiers, servo control amplifiers, motor speed control equipment, a.c. power units and automatic regulators. The new "Silicontrol" gate drive for silicon controlled rectifiers is also demonstrated.

*Parmevo, Ltd., Percy Road, Aylestone Park, Leicester.*

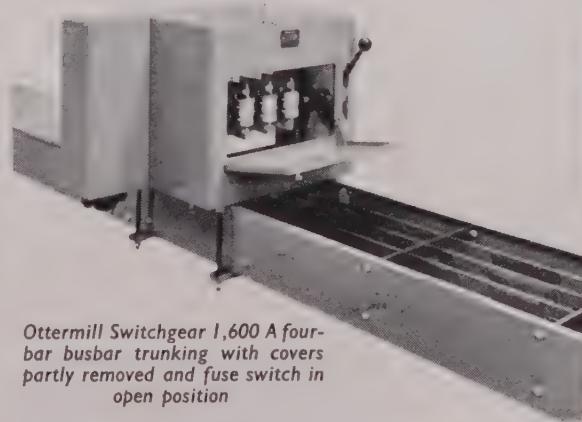
#### PARMITER, HOPE & SUGDEN (J17)

Medium voltage switchgear. Products displayed include unit and cubicle type switchboards, "Fluvent-Falcon" fuse switches, industrial distribution boards and panels, changeover switches, fuse switches, insulated house service and street lighting fuses, flame-proof unit switchboards, fuse links, overhead line fuses and an oil burner control panel. New products displayed include two ranges of rewirable cartridge fuse links and a cubicle switchboard with heavy duty fuse switches.

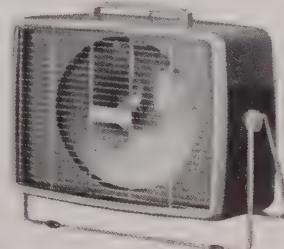
*Parmiter, Hope & Sugden, Ltd., Newton Avenue, Longsight, Manchester, 12.*

#### PARTRIDGE, WILSON (A7)

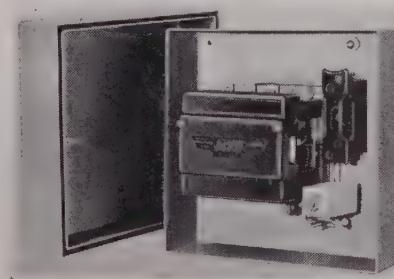
Battery chargers, rectifiers and power distribution transformers. A Davenset C.V.C. (current voltage control) charger shown can provide charges down to 3½ hr for traction batteries. A constant voltage automatic unattended charger for stationary batteries is shown. The latest automatic charger for single electric vehicle batteries now employs new silicon diodes, as does a new range of cathodic protection rectifiers. The transformer rectifier set for electro-plating exhibited is fitted with



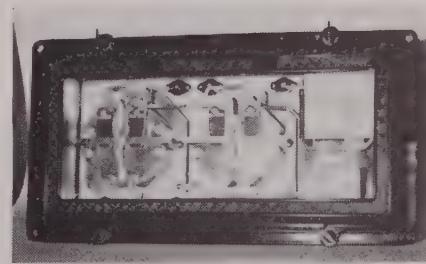
Ottermill Switchgear 1,600 A four-bar busbar trunking with covers partly removed and fuse switch in open position



Above : Morphy-Richards 2 kW "Bermuda" fan heater



Heating control contactors shown by M.T.E. Control Gear, Ltd.



Nalder Bros. & Thompson electrostatic earth-leakage relay

germanium diodes. Other products shown include distribution transformers using cold-rolled grain-oriented steel and available from 5 to 25 kVA for 11,000/250 V service.

*Partridge, Wilson & Co., Ltd., Daventry Electrical Works, Evington Valley Road, Leicester.*

#### PERKINS & SMITH (X13)

Drills, trepanning tools, masonry saws, drills and grinding wheels. The "Super Concrete Master" trepanning tool shown produces round holes in concrete and hard masonry material.

*John M. Perkins & Smith, Ltd., London Road Works, Braunston, nr. Rugby.*

#### PERMACEL TAPES (Y5)

Insulating materials. A range of electrical tapes for applications requiring insulation at class E temperatures are shown. The backing materials include glass, acetate rayon and cotton cloths, plasticised p.v.c. and "Melinex" films. Amongst the adhesives shown are the Permacel 2-in-1 combined pressure sensitive and thermosetting types. Two paper tapes are shown for the first time. Other exhibits include metallised labelling tapes and preformed labels.

*Permacel Tapes, Ltd., Slough, Bucks.*

#### PERMALI (H9)

Insulating materials. Glass fibre materials in tube and rod form are being displayed for the first time. The "Wave-Wound" tube for arc control pots, conduits conducting cooling air, etc., is available in diameters up to 6ft. Extruded glass fibre rods are shown in diameters from a  $\frac{1}{2}$  to  $\frac{3}{4}$  in. Large exhibits comprise a densified-wood brushgear cover and support and a glass fibre end cover roft by 9ft with honeycomb core. Cast resin components displayed include new designs of bushings, terminal bases and boards, busbar supports and encapsulated parts. Additional exhibits include processed p.t.f.e. in sheet, rod, tube, and tape form and densified-wood insulation for track circuiting.

*Permal, Ltd., Bristol Road, Gloucester.*

#### PETBOW (P10)

Mobile generating sets, welding generators and control cubicles and switchboards, including a new range of generators.

*Petbow, Ltd., Sandwich, Kent.*

#### PHILIPS ELECTRICAL (J14)

Lamps and lighting fittings. This stand is lit mainly by double-coated Colour 32 fluorescent lamps. Other lamps shown include sodium, mercury, blended, mercury fluorescent and tungsten types. The new "Fantasie" lamps, large decorative bulbs that need no shade, and new "Streamlite" lighting fittings are exhibited.

*Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.*

#### PINCHIN, JOHNSON (Y2)

Insulating materials. The applications of various electrical insulating varnishes, lacquers and compounds are described. There is also a display of electrical motors and generators showing progress in design from 1858 to the present day. Working prototype motors demonstrate the principles of new types of machines now under development.

*Pinchin, Johnson & Co., 4, Carlton Gardens, London, S.W.1.*

#### PIRELLI-GENERAL (U8)

Power and telecommunication cable. High voltage, high-stress, oil filled cables, telecommunication cables, medium and low voltage paper, rubber and plastic insulated cables and covered conductors are shown. New "Volutalit" resin components for high voltage cable accessories are shown, also a compact joint for l.v. cables. New products on view include an oil immersed termination for 33 kV three-core oil-filled cables and a straight joint for 33 kV three-core solid or m.i.n.d. cable.

*Pirelli-General Cable Works, Ltd., Eastleigh, Hampshire.*

#### PLESSEY (S4)

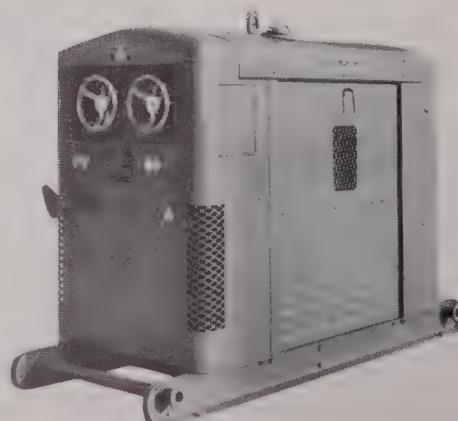
Wiring accessories, switches, transformers, coils, and relays. The Wiring and Connectors Division is showing wiring accessories including cable assemblies and connectors. The Components Division is exhibiting centrifugal and rotary switches; resin cast and industrial transformers; lampholders; a.c. relays; telephone, contactor and toroidal coils; suppression components; ferrites and ceramics.

*The Plessey Co., Ltd. (Wiring and Connectors Division), Cheney Manor, Swindon, Wiltshire.*

*(Components Division), Ilford, Essex.*

#### POLES, LTD. (J21)

Steel poles for power and telephone lines, street lighting columns and radio masts. Models of galvanised sectional steel poles are displayed. "Adastra" street lighting columns are available for mounting heights from 13ft up to



Petbow arc welding generator

soft. Other products featured include "Adastra" floodlighting towers.

*Poles, Ltd., Tyburn Road, Erdington, Birmingham, 24.*

#### POWER CENTRE (H15)

Industrial distribution gear. Busbar, cable and lighting trunking, cable tap systems, rising main systems, fuse units and fuse boards switch fuses and fuse switches, busbar chambers, switchboards, and cable boxes and accessories are represented. Cable trunking is shown in surface, flush, floor and underfloor patterns, plug-in fuse boxes can be supplied for the busbar trunking while power taps can be incorporated without additional drillings in the lighting trunking. The cubicle type fuse switchboards have front access and a minimum projection of 15in.

*The Power Centre Co., Ltd., Lloyd Street, Wednesbury, Staffordshire.*

#### POWER CONNECTORS (A1)

Connectors, clamps and fittings. Newly developed busbar fittings are shown.

*Power Connectors, Ltd., "Barry House," Worple Road, Wimbledon, London, S.W.19.*

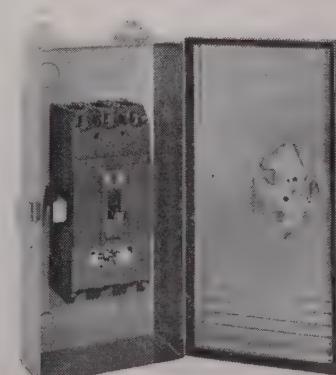
#### PRECISION ENGINEERING EQUIPMENTS (P13)

Decimal and f.h.p. motors. Squirrel cage, split-phase, capacitor, universal, synchronous, shaded pole, d.c. and other motors up to 1 h.p. with various types of bearings, enclosures or mountings are shown. Internal or external brakes can be fitted. With geared units reductions from 2.5 : 1, down to 125,000 : 1 are available. Constant speed motors can be provided with an accuracy of  $\pm 1$  per cent using either a centrifugal brake or a centrifugal governor contact.

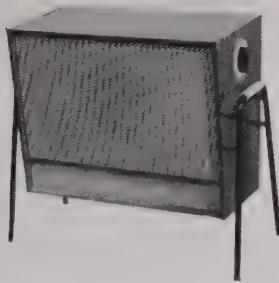
*Precision Engineering Equipments, Ltd., 1, Twatling Road, Barnt Green, Birmingham.*

#### PRINTED CIRCUITS (L5)

Single- and double-sided, flexible and rigid "Plasmet" copper etched wiring circuits. In addition, strain gauges, cable forms, heating elements and code



Moulded-case 100 A 440 V air break circuit-breaker mounted in a steel case (A. Reyrolle & Co., Ltd.)



Remploy fan heater



Revo Electric fluorescent bulkhead fitting

discs are on view, and for the first time "Plasmet" printed armatures for small electric motors.

*Printed Circuits, Ltd., Barnet Bypass, Stirling Corner, Boreham Wood, Herts.*

#### PRITCHETT & GOLD (F17)

Batteries and control equipment for emergency lighting and switch-tripping. The principal feature is a replica of part of the h.v. switch room in a British Railways substation of the Kent coast electrification. The 100 V battery exhibited on a three-tier double-row stand incorporates high performance lead-acid Planté type cells in sealed glass boxes. Other products displayed include "Dagenite" batteries for diesel engine starting, signals, tractors and electrified fences, and lightweight units for aircraft.

*The Pritchett & Gold and E.P.S. Co., Ltd., Dagenite Works, Dagenham Dock, Essex.*

#### PROCESS CONTROL GEAR (J4)

Thermostats and temperature control equipment. Space and storage heating equipment thermostats are shown, also temperature controls for greenhouses, air conditioning, industrial processes and oil burners. New products shown include an inside/outside space heating controller and a frost protection thermostat for greenhouses.

*Process Control Gear, Ltd., Lattimore Road, St. Albans, Hertfordshire.*

#### R. B. PULLIN (J27)

Precision instruments and electronic apparatus. The Process Control Division is showing a remote servo position indicating system, a "Stepping Pulse" data transmission system operating from temperature and differential pressure sensing elements, a "Unibloc" three-element boiler drum level control system, electronic and moving coil, single and multi-point recorders and a furnace temperature control system. New thermostats are being shown by the Thermostat Division while the Motor & Servo Component Division are showing new 50 c/s servo motors,

d.c. instrument motors, motor-generators, and magnetic and transistor servo amplifiers available with in-line and plate gear boxes.

*R. B. Pullin & Co., Ltd., Phoenix Works, Great West Road, Brentford, Middlesex.*

#### PYE (Z16)

Radio telephones, amplifiers, electronic telephone exchange equipment and telemetry apparatus are being shown by Pye Telecommunications, Ltd. Pye Electric, Ltd., are displaying communication cables and a small transformer for signalling purposes, while a small induction heater is being exhibited by Pye, Ltd. A 50 kVA three-phase power transformer is displayed by the associated Lindley Thompson Transformer & Service Co., Ltd.

*Pye, Ltd., P.O. Box 49, Cambridge.*

#### PYROTEX (G9)

Mineral insulated copper covered cable. On view are 440 and 660 V power, light and heating m.i.c.c. cables. Thermo-electric cables in stainless steel and mild steel sheaths with alternative conductor metals are also exhibited. Thermocouples with overall diameters down to 0.020 in, covering a temperature range from sub-zero to 1,100°C are displayed, accompanied by the complementary range of compensating cables. Pre-assembled cable units are also exhibited.

*Pyrotenax, Ltd., Hedgeley Road, Hebburn, Co. Durham.*

#### RADIATION (S16)

*See Electrical Division of Radiation, Ltd.*

#### RADIOVISOR PARENT (R10)

Photo-electric and electronic control and measuring equipment. The exhibits include "Heat Control" electronic weld timers, a range of intruder alarm units, automatic door opening equipment, photo-electric print registration units and static eliminators. Photo-electric and electronic level controls are demonstrated. Smoke density indicators, smoke alarms, hydraulic

press brake guards and the "Savelite" photo-electric automatic lighting control are shown as working models.

*Radiovisor Parent, Ltd., Stanhope Works, High Path, London, S.W.19.*

#### RAWLPLUG (L6)

Fixing devices for masonry, drills and drilling machines. The ranges of "Rawlplugs" and "Rawlbolts" (metal expansion bolts) are shown together with "Durium" drills for rotary and percussion operation, a two-speed electric drill with  $\frac{1}{5}$  in self-tightening chuck, the "Vibroto" rotary/vibratory drilling machine with a  $\frac{1}{2}$  in chuck and the Rawlplug "De-Speeder" for reducing the speed of an electric drill by a 4 : 1 ratio.

*The Rawlplug Co., Ltd., Cromwell Road, London, S.W.7.*

#### RECORD ELECTRICAL (A10)

Electrical measuring instruments, tachometer indicators, recorders, and moving-coil relays. A large part of the stand is devoted to "Cirscale" instruments, including the miniature "B" series, larger sizes up to the 30 in dial "Mammoth" and the "A" series which now includes "Clearview" and internally illuminated models. Graphic recorders with various types of chart drive and writing systems are shown together with moving-coil relays for overspeed, overcurrent and similar protection.

*The Record Electrical Co., Ltd., Cirscale Works, Broadheath, Altrincham, Cheshire.*

#### REMPLOY (R9)

Heating elements, fan heater and soldering iron. In addition to a range of domestic appliances which incorporate Remploy-Stillman heating elements, the exhibits on this stand include a 25 W soldering iron, with an indicator lamp in the plastic handle showing when the iron is energised, and a new fan heater. This has a wooden finish protected by a concealed metal shield and incorporates red and blue lights which indicate whether the unit has been switched to hot or cold.

*Remploy, Ltd., Egginton House, 25-28, Buckingham Gate, London, S.W.1.*

#### REVO ELECTRIC (E9)

Industrial, commercial and street lighting; switchgear and domestic appliances. In addition to a range of domestic appliances including the "Family Special" cooker, new products shown include the 200 W "Hyperion" sodium main road lighting lantern, the 60 W "Bromley" sodium post top, 150 W aluminium and cast iron bulkhead fittings and 2 ft 40 W switchless start fluorescent dust-proof fittings.

*The Revo Electric Co., Ltd., Grove-land Road, Tipton, Staffs.*

#### REYROLLE (D9)

High, medium and low voltage switchgear and distribution equipment.

H.v. equipment includes a unit from a new range of 33 kV outdoor oil-break circuit-breakers with ratings up to 1,200 A and 750 MVA. A weather-proof version of the type LMT 11 kV distribution gear, type LMI ring-main unit which is essentially a type LMT circuit-breaker with two integral wing oil-switches and a type OYS 11 kV pole-line sectionaliser are shown. In the medium voltage range there is a 1,200 A air-break circuit-breaker coupled to a cubicle-type switch and fuse distribution board, a medium voltage switch and fuse distribution board of the HH design, a range of 440 V moulded-case air-break circuit-breakers rated from 100 to 800 A, and a series of cartridge fuses and industrial type protected plugs and sockets.

*A. Reyrolle & Co., Ltd., Hebburn, Co. Durham.*

#### RHEOSTATIC CO. (L3)

Thermostats and heating and ventilating control systems. The principal feature is the new Satchwell TM room thermostat for electric heating rated at 20 A a.c. Also featured are the "Ratiomatic" automatic control system for under floor heating, the "Super-switch" infinitely variable boiling plate control including the boost type for rapid warming of smaller boiling plates, and a representative selection of automatic firing controls.

*The Rheostatic Co., Ltd., Slough, Buckinghamshire.*

#### S. A. RHODES (Q3)

See G. Corner & Co., Ltd.

*S. A. Rhodes, Ltd., Johnson Brook Road, Hyde, Cheshire.*

#### RIST'S WIRES & CABLES (S8)

Preformed wiring harnesses, moulded electrical assemblies and connections and ribbon, high temperature, and industrial cables and flexibles.

*Rist's Wires & Cables, Ltd., Lower Milehouse Lane, Newcastle, Staffordshire.*

#### D. ROBINSON (Y3)

Distributors for Rodene timers, C & S and PAR relays. See Rodene Electrical Co., Ltd., and Clifford & Snell, Ltd.

*D. Robinson & Co., Ltd., 5-7, Church Road, Richmond, Surrey.*

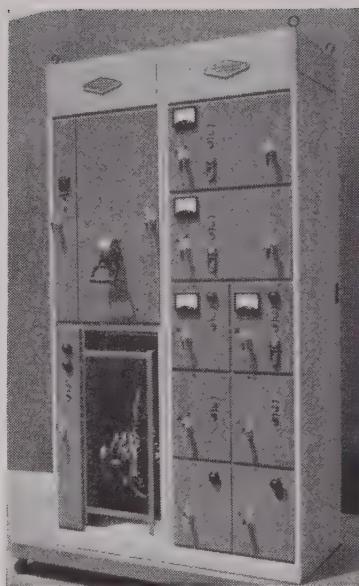
#### RODENE ELECTRICAL (Y3)

Among the products on view is a range of process timers including "Magnacam," "Varicam" and "Minicam" multi-circuit timers with continuous and auto-reset actions; the 25 series of auto-reset single stage timers; the 7000 series of auto-reset timers; stepping relays; and a bonus clock.

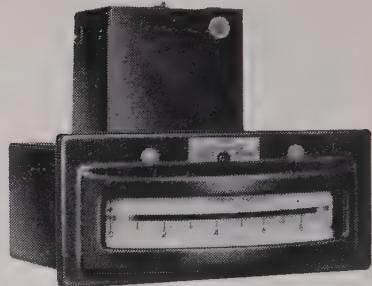
*The Rodene Electrical Co., Ltd., Isleworth, Middlesex.*

#### ROLCO ENGINEERING (D1)

Direct drive and geared shaded pole motors. New this year is a miniature



Siemens-Schuckert cubicle type distribution board



Sifam "Pyromaxim" on-off temperature controller

"Cliptite" ceiling fittings, and "Plinth" lights. New products include mushroom downward lighting floodlamps for illuminating flower beds and weatherproof trough lighting units for general garden illumination.

*Rowlands Electrical Accessories, Ltd., 157-158, Hockley Hill, Birmingham, 18.*

#### ROYAL WORCESTER (P4)

Industrial ceramics for insulation. This company is exhibiting an alumina ceramic marketed under the trade name "Regalox" and a wide range of components including precipitator rods and tie bars, insulator formers used in the manufacture of resistors, and terminal block insulators for high temperature applications.

*Royal Worcester Industrial Ceramics, Ltd., Tonyrefail, Glamorgan.*

#### SAMS ELECTRICAL LONDON (U7)

See S. D. Sullam, Ltd.

*Sams Electrical London, Ltd., 9-11, Tabernacle Street, London, E.C.2.*

#### Wm. SANDERS (K3)

Industrial and domestic switch and fuse gear. The display includes cubicle and unit type switchboards, "Sandaclad" h.b.c. fuse switches and the Isoearth switch, "Sandasteel," "Sandalita" and "Sandaline" fuseboards, consumer units, cooker control units, rubber plugs, h.b.c. cartridge fuse links, and busbar chambers. New this year is a "Sandacee" a.c. switch and fuse and an 800 A "Sandalite" fuse switch.

*Wm. Sanders & Co. (Wednesbury), Ltd., Falcon Electrical Works, Riddings Lane, Wednesbury, Staffordshire.*

#### SANGAMO WESTON (H10)

Electrical metering equipment, measuring instruments and photographic exposure meters. Examples of single- and poly-phase watthour meters are shown, with demonstrations of calibration and testing these and of the newly introduced "Floton" magnetic bearing. Over twenty different types of time switches are on show including models with solar-dials, 48, 24, 6, 3 and 1 hr dials in addition to spring reserve units and interval timers.

*Sangamo Weston, Ltd., Gt. Cambridge Road, Enfield, Middlesex.*

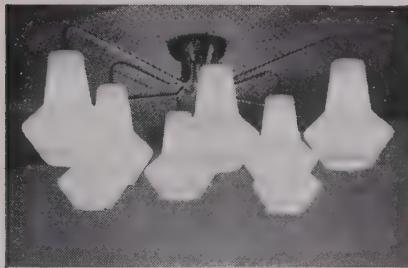
#### ROSS, COURTNEY (W2)

Terminals, crimping tools, cable sockets and clips, and cable connectors. The exhibits include wire end and pillar terminals, solder tags, brass and copper cable sockets, steel cable and battery charging clips, fuse clips, h.v. terminals and split and solid brass cable connectors. New products include items from the Thomas & Betts-Kent range of terminals suitable for crimping, pre-insulated terminals, inline connectors, strip terminals and "Ty-Rap" cable straps.

*Ross, Courtney & Co., Ltd., 25, Ashbrook Road, Upper Holloway, London, N.19.*

#### ROWLANDS ELECTRICAL ACCESSORIES (E5)

Industrial, commercial and domestic lighting fittings. Those on view include samples from the R.E.A.L. range of floodlanterns, "Reflector-tight" non-corrodible fittings, "Reelite" mirror lined reflectors and R.E.A.L. vitreous enamelled reflector



SLR Electric "Comtaire/608" lighting fitting



Simplex Area Junior Reflecto-Flood lighting fitting

#### JOSEPH SANKEY (J18)

Core stampings, die-cast rotors, and welded cores and stators. The welded stators shown demonstrate the use of "DRNS" as an inter-laminar insulation.

*Joseph Sankey & Sons, Ltd., Bankfield Works, Bilston, Staffordshire.*

#### SANTON (G3)

Domestic and industrial water heating equipment and rotary switches. Included among the exhibits are a range of industrial immersion heaters for use in water, oils, caustics, acids, etc., and a range of flameproof oil immersion heaters. Also featured is the "Hercules" off-peak combination cylinder. The rotary switches displayed range from 10 to 500 A capacity and include examples of the new panel productions.

*Santon, Ltd., Somerton Works, Newport, Mon.*

#### JULIUS SAX (Z8)

Fire and burglar alarms, staff location systems, domestic bells, indicators and relays, and wiring accessories including wall sockets and plugs.

*Julius Sax & Co., Ltd., 24, Commerce Road, Brentford, Middlesex.*

#### GEO. H. SCHOLES (D8)

Switch and fuse gear and wiring accessories. The exhibits include "Wylex" switch-fuse control units and distribution boards of both all-insulated and metalclad types. Also shown is the "Extenso" system for extending existing fuse unit installations, cooker control units, 30 and 60 A double pole a.c. switches, and a 20 A triple pole 500 V isolator. The wiring accessories include a dual plug system for ring main and non-ring main circuits, clock connectors and switched spur boxes with and without pilot lights. New this year is a range of switch-fuse control units for equipment operating on normal and off-peak tariffs.

*George H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester, 22.*

#### GEO. L. SCOTT (W9)

Laminations and laminated assemblies for magnetic circuits in electrical machines. In addition to aluminium die-cast and copper bar rotor assemblies, the exhibits include transformer and

choke laminations, toroidal cores, C-cores, and magnet assemblies for switchgear. These are available in both oriented and non-oriented silicon iron and nickel iron alloys. Also shown are toroidal cores employing high permeability, square loop and 47 per cent nickel iron strip material produced by powder metallurgy methods, and bobbin cores using ultra-thin tape having fast switching characteristics.

*Geo. L. Scott & Co., Ltd., Cromwell Road, Ellesmere Port, Cheshire.*

#### S.G.E. SIGNALS (Y12)

Road and railway signalling equipment.

*S.G.E. Signals, Ltd., East Lane, Wembley, Middlesex.*

#### SHARP CONTROL GEAR (P17)

*See Expert Industrial Controls, Ltd.*

*Sharp Control Gear, Ltd., Lount Works, Ashby-de-la-Zouch, Leicestershire.*

#### SHELL CHEMICAL (F3)

Cable jointing using "Epikote" resins and electrical component encapsulation.

*The Shell Chemical Co., Ltd., Marlborough House, 15-17, Great Marlborough Street, London, W.1.*

#### SIEMENS-SCHUCKERT (M9)

Industrial and flameproof switchgear. New equipment shown includes a cubicle type distribution board of double tier design equipped with draw-out air-break circuit-breakers up to 1,000 A rating, one breaker being motor operated. Also shown is a flameproof distribution board containing 50 A contactors for motor control, a range of automatic contactor starters of the direct-on-line, reversing and star-delta type up to 100 h.p., a current balance earth leakage and monitoring circuit for the protection of portable equipment and a range of miniature circuit-breakers. Flameproof mining transformers are also shown.

*Siemens-Schuckert (Great Britain), Ltd., Faraday Works, Great West Road, Brentford, Middlesex.*

#### SIFAM (Q13)

Electrical measuring instruments and pyrometry equipment. Among the measuring instruments on view are

moving coil units in the new "Wessex" range. A new miniature edgewise measuring instrument is also shown. Among the pyrometric instruments and thermocouples displayed are the "Pyromaxim" on/off and proportional controllers and a new series of resistance pyrometers incorporating temperature ranges between -200 and +500°C, with a minimum full scale of 20°C. Another new product is a magnetic thermocouple for use with moulding tools, etc.

*The Sifam Electrical Instrument Co., Ltd., Woodland Road, Torquay, Devon.*

#### SIMMONDS AEROCESSORIES (V8)

Recorder, switches and fastenings. In addition to a potentiometric temperature recorder, pressure switches, conductivity level switches and lamp annunciations, the exhibits include "Spire" speed fasteners, "Nyloc" self-locking nuts and potentiometer anti-vibration nuts.

*Simmonds Aerocessories, Ltd., Treforest, Pontypridd, Glamorgan.*

#### SIMPLEX ELECTRIC (H13)

Lighting equipment, switchgear, automatic control gear, floor warming, wiring accessories and domestic equipment. The Simplex lighting equipment on view includes anti-corrosive fluorescent fittings, "Corrilux" bulkhead fittings, reflectors in "Arvit" (acid and alkali resistant vitreous enamel), floodlight fittings, recessed ceiling fluorescent "Panellite" fittings, and "Airflo" high bay lighting fittings. In addition, switchgear, automatic control gear, flameproof equipment, floor warming systems, conduit and conduit fittings, an under floor duct system, wiring accessories and cooker control units are on view. The Creda equipment shown includes water and space heaters, electric fires and refrigerators while new products include the "Constellation" double oven cooker, the "Caribbean" infra-red heater, the "Debonair De-Luxe" spin dryer, the "Laundrair" combined washer, rinser and spinner, the "Laundrair" tumbler dryer and the "Mercury Super Four" cooker. New Simplex products include 10 A motor starters, a 60 A thermal overload relay and a range of push buttons.

*The Simplex Electric Co., Ltd., Creda Works, Blythe Bridge, Stoke-on-Trent, Staffordshire.*

#### SLR ELECTRIC (H4)

Fluorescent and tungsten fittings for commercial and decorative installations.

*SLR Electric, Ltd., Welbeck Works, Welbeck Rd., South Harrow, Middx.*

#### SMALL ELECTRIC MOTORS (H18)

Rotating machines. Standard f.h.p. and industrial motors displayed include single and three-phase a.c. and d.c. motors, universal and shaded pole motors, low voltage battery-operated motors up to 10 h.p. with control gear, alternators up to 6 kVA single and

three-phase and 250 A single-phase 427 c/s welding alternators. Other products shown include a stabilised electronic timer control unit and new rotor and stator units up to 10 h.p. for refrigerator units.

*Small Electric Motors, Ltd., Eagle Works, Churchfields Road, Beckenham, Kent.*

#### FREDERICK SMITH (L5)

Exhibits include "Anacos" bare copper and copper alloy rods, bars, wires, strands, strips and sections and "Salcos" aluminium wires and strands.

*Frederick Smith & Co., Anaconda Works, Salford, 3, Lancs.*

#### SMITH METERS (Q5)

House service meters and test sets. The repeaters shown enable meter readings to be grouped in blocks of up to 40. They are a.c. operated, consuming 1.5 VA, and each comprises a five figure register driven by a five pole rotor co-acting with two fixed electromagnets. The type ASM meter features controls and meters a supply for space heating at pre-arranged periods. The 40 or 80 A switch and a standard single-phase meter element are connected in series. Other products shown are the type AM credit meter, a polyphase meter, the "Sincos" meter for measuring kVA demand, slot meters and a meter test set.

*Smith Meters, Ltd., Rowan Road, Streatham Vale, London, S.W.16.*

#### SMITHS CLOCK & WATCH DIVISION (H8)

Electric clocks and time switches. Products shown include timers and time switches, automatic-control equipment, synchronous motors, automatic de-frosting devices and master clock systems. New products displayed include timers and time switches for domestic appliances, and "Sectric" clocks. The new "Callglow" alarm clock incorporates an electroluminescent dial background of ceramic-on-metal construction. A control is provided to adjust the light intensity.

*Smiths Clock & Watch Division, Sectric House, Waterloo Road, Cricklewood, London, N.W.2.*

#### SMITHS INDUSTRIAL DIVISION (H8)

Electric tachometers, calibrated relays, instruments for railway electrification schemes, "Desynn" systems for remote indication, electronic batch counters, photo registration units, frequency meters, sequential unmanned scanning and indicating equipment. New products shown include gauge reduction indicators.

*Smiths Industrial Division, Chronos Works, North Circular Road, London, N.W.2.*

#### SOFONO (P8)

Industrial and domestic heaters. Three new "Jupiter" infra-red heaters

on show are the 1,500 W adjustable wall-mounting heater, the industrial chain-hanging heater and the 2 kW portable free-standing heater. Other products shown are the "Space-master" convectors and reflector/convectors.

*Sofono Electrical Division of Federated Foundries, Ltd., 4, Stratford Place, London, W.1.*

#### SOUTH LONDON ELECTRICAL (S9)

Welding, plenum and refrigeration equipment and high vacuum ovens. The welding equipment shown includes micro-spot welding apparatus, butt welding equipment capable of handling down to 0.003in diameter wires and a high-speed projection welder for transistor encapsulation. The plenum assembly equipment shown is designed for semiconductor and radio valve assembly. Other products displayed include the "Ultronaire" electrostatic air filter, high-speed heavy duty contactors, and deep freeze units capable of reaching -100°C.

*South London Electrical Equipment Co., Ltd., Lanier Works, Hither Green Lane, London, S.E.13.*

#### SOUTH WALES SWITCHGEAR (N6)

High voltage and distribution switchgear and transformers. An indoor 11 kV 250 MVA non-extensible ring main unit is shown, also a flush mounted cubicle type medium voltage distribution board incorporating quick-make quick-break fuse switches and associated contactors, and a 500 kVA 11,000/433 V T1 transformer.

*South Wales Switchgear, Ltd., Blackwood, Monmouthshire.*



Twelve-hour alarm with electroluminescent dial (Smiths Clocks & Watches, Ltd.)

#### SOWERBY ELLISON (Q7)

See Suntax Safety Glass Industries, Ltd.

*Sowerby's Ellison Glass Works, Ltd., Gateshead 8, Co. Durham.*

#### SQUARE D (T6)

Motor control equipment, contactors, relays, pressure switches, and limit switches. Reversing and non-reversing a.c. motor starters and contactors up to 200 h.p. at 600 V and associated relay equipment are shown. New products on view include a timing relay, an illuminated push button, a 10 A d.c. operated heavy duty industrial relay, pilot lights for voltages between 6 and 230 using a 6 V lamp, and plastic wire ducting.

*Square D, Ltd., Cheney Manor, Swindon, Wilts.*

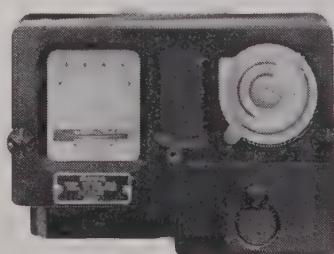
#### STANDARD INSULATOR CO. (Z2)

Rubber mouldings and metal clips. Products on show include moulded rubber grommets; industrial rubber mouldings, including cathode ray tube masks; battery charging and test clips; and double band clips.

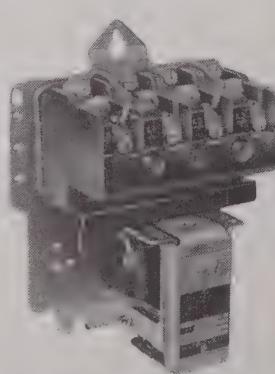
*The Standard Insulator Co., Ltd., Standard Works, Bridge Road, Camberley, Surrey.*

#### S.T.C. (E8)

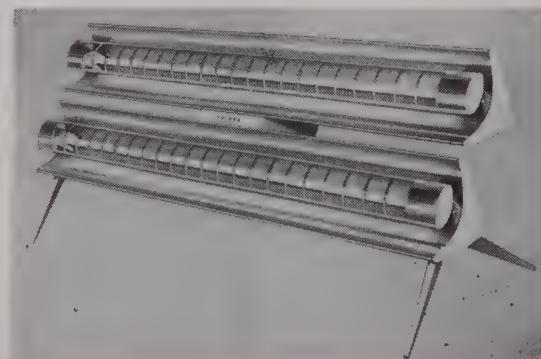
Remote control and indication equipment, rectifiers, capacitors and cables. The "Packaged" supervisory system demonstrated can work over two or four pilot cores or equivalent voice-frequency or radio channels and employs coded signalling. The facilities available include remote indication of the closing or opening of up to 16



Smith Meters space heating meter



Square D tropicalised contactor



Portable 2 kW "Jupiter" infra-red heater (Sofono Electrical Division of Federated Foundries, Ltd.)

electrical contacts, remote control of up to 16 functions, two-way telephone communication and pilot line and out-station power supply supervision. Other exhibits include a 500 kW silicon rectifier equipment, a SenTerCet cathodic protection equipment, giving an output of 50 A at 7 to 48 V, power factor improvement capacitors, rectifier and industrial r.f. heating valves and plastic dielectric and aluminium sheet telecommunication cables. A new constant current battery charger using silicon rectifiers and incorporating transductor controls is shown. It can charge up to 32 lead-acid cells at 30 A.

*Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.*

#### J. G. STATTER (E4)

High voltage and industrial switchgear. Metalclad 11 kV 350 MVA drop-down drawout oil circuit-breaker equipments available up to 1,600 A rating are shown, including air insulated and compound filled types as well as those suitable for outdoor installations. Metalclad automatic oil fuse switch units and fault-making load-breaking non-automatic oil switch units suitable for coupling to oil fuse switch units are also shown. The l.v. switchgear exhibited includes air-break and oil immersed types, the former having interrupting circuit ratings up to 31 MVA at 415 V and 3,000 A current carrying capacity. Air circuit-breakers for ship d.c. installations are shown, also industrial non-drawout and horizontal-drawout l.v. oil circuit-breaker units, knife and isolating switches, current transformers, terminal boards and non-ferrous castings and mouldings.

*J. G. Statter & Co., Ltd., 82, Victoria Street, Westminster, London, S.W.1.*

#### STEATITE & PORCELAIN (V5)

High voltage porcelain insulators. Fifteen post insulator units in conformance with B.S. 3297 : 1960 are shown. A standard 275 kV outdoor post insulator of eight units fitted with a grading ring is compared with its seven-unit indoor counterpart, the four upper units of which are treated with "fringe" conducting glaze. Examples of catenary insulators, bushings, third-rail and post insulators for railway duty are also shown. Standard insulators and low voltage ceramic insulators for appliances and refractories are also exhibited.

*Stearite & Porcelain Products, Ltd., Bewdley Road, Stourport-on-Severn, Worcestershire.*

#### STERLING CABLE CO. (V3)

Butyl insulated power cables, plastic insulated cables for high voltage high current pulsing, silicone rubber insulated cables and "Solidal" cables. New methods of jointing and stress relieving terminations are displayed.

*The Sterling Cable Co., Ltd., Aldermaston, Berkshire.*

#### STERLING LIGHT (X5)

Lighting fittings, including pleated and raffia contemporary shades and the "Sterling" light.

*The Sterling Light Co., Ltd., 50a, Ledbury Road, London, W.11.*

#### STREAM-LINE FILTERS (H20)

Oil purifying equipment. A self-contained high vacuum transformer insulating oil filter. The type P8 portable insulating oil filter and pumping set is also on show.

*Stream-Line Filters, Ltd., Henley Park, Guildford, Surrey.*

#### S. D. SULLAM (U7)

Lighting fittings, table lamps, torch cases and decorative lighting sets.

*S. D. Sullam, Ltd., 9-11, Tabernacle Street, London, E.C.2.*

#### SUNTEX SAFETY GLASS (Q7)

Moulded and extruded reflectors and diffusers for fluorescent lighting in Perspex and Diakon, street lamp covers and refractor plates, pressed glass lamp covers and lenses, cast and extruded "Suntex" acrylic tubing.

*Suntex Safety Glass Industries, Ltd., Thorney Lane, Iver, Buckinghamshire.*

#### SWIFTS OF SCARBOROUGH (Q12)

Cable trunkings. Perforated cable trayplate and fittings which conform to Admiralty pattern are shown, also "Solidex" unslotted angle and fittings.

*Swifts of Scarborough, Ltd., Olympia Works, Durham Street, Scarborough.*

#### SWITCHGEAR & COWANS (W8)

High voltage switchgear. A 400 A 11 kV, 250 MVA extensible outdoor switchgear unit shown has a type A4 oil circuit-breaker with two 400 A fault-breaking load-breaking oil switches. The non-extensible 11 kV 250 MVA indoor ring main unit has a vertical isolation type A4 single-break oil circuit-breaker and 400 A wing oil switches. Also shown is an 11 kV vertical isolation air insulated circuit-breaker equipment incorporating a type A6 350 MVA oil circuit-breaker. The single phase 25 kV indoor switchgear unit shown has a type K1 350 MVA single-break oil circuit-breaker. A model of the 1,000 MVA type K1 33 kV outdoor oil circuit-breaker is displayed.

*Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, 16.*

#### H. D. SYMONS (K18)

Flexible insulating materials. Products on display include epoxy and polyester varnished glass insulating materials, a new form of Terylene, and a new base fabric which when varnished provides class B and class F insulating tape with some stretch in straight cut form. New class B slot insulation consists of "Melinex" film bonded to specially treated Terylene paper. Flexible insulating materials on show

include varnished cotton, silk, nylon, Terylene and glass.

*H. D. Symons & Co., Ltd., Park Works, Kingston Hill, Surrey.*

#### SYNCHRONOME CO. (M3)

Master and slave clocks, programme controllers, time recorders, a watchman's patrol system and electronic timing units. New products shown include an automatic calendar clock for either half minute impulse or synchronous use, and inaudible minute impulse movements.

*The Synchronome Co., Ltd., Woodside Place, Mount Pleasant, Alperton, Middlesex.*

#### TAYLOR, TUNNICLIFF (U5)

Porcelain and ceramic insulators and associated equipment. On show are e.h.t. and h.t. bushings, current transformer housings, switchgear supports, post and transmission line insulators. Die-pressed porcelain for electrical accessories, refractory element formers for domestic and industrial heating, and ceramics for the radio and electronic industry are also on show.

*Taylor, Tunnicliff & Co., Ltd., Eastwood, Hanley, Stoke-on-Trent.*

#### TAYLOR, TUNNICLIFF (REFRACTORIES) (U5)

Refractory element formers for all types of heating appliances, "Fish-spine" insulating beads and h.f. ceramics.

*Taylor, Tunnicliff (Refractories), Ltd., Albion Works, Longton, Stoke-on-Trent, Staffordshire.*

#### TECHNOGRAPH ELECTRONIC PRODUCTS (Y14)

Rigid printed circuits with plated-through holes. These can be flush-bonded if required. Components which are available in printed circuit form include switch plates, computer and digitiser discs, resistors, strain gauges, inductors, heating elements, de-icing mats, thermo-couples and power resistors. In addition, details are given of a chemical milling process for the production of thin laminations.

*Technograph Electronic Products, Ltd., Fleet, Aldershot, Hampshire.*

#### TELCON-MAGNETIC CORES (H6)

Strip wound cores in grain-oriented silicon iron. These can be supplied in various grades and thicknesses of material, and examples of "C," "E," toroidal and special types are exhibited.

*Telcon-Magnetic Cores, Ltd., Chapelhall Industrial Estate, Chapelhall, Lanarkshire.*

#### TELCON METALS (H6)

The exhibits indicate the recent advances which have been made in alloys and techniques in the soft magnetic materials field, in beryllium copper alloys and in thermostatic bimetals. The magnetic alloys shown include "Supermendur" (permeability

of 80,000), "Super-Radiometal" (140,000), and "Supermumetal" (more than 500,000). A feature of the stand is a 3ft thermometer employing Telcon bi-metal and registering the hall temperature. Also on show are miniature ultra-thin tape cores wound on ceramic bobbins and available in several grades of magnetic alloys.

*Telcon Metals, Ltd., Manor Royal, Crawley, Sussex.*

#### TELEMETERS (V7)

Remote position indication equipment in various forms including both inductive and d.c. types, liquid level measuring equipment and remote control equipment.

*Telemeters, Ltd., 119, Victoria Street, London, S.W.1.*

#### TEMCO (H6)

Fine wires in stainless steels in the ferritic, martensitic and austenitic groups, together with resistance wires to B.S. 115 : 1954.

*Temco, Ltd., Lydbrook, Gloucestershire.*

#### TERRITORIAL ARMY (O15)

In addition to films depicting various aspects of life in the Territorial Army, this display by the 65th Signal Regiment T.A. includes a portable transceiver in working and stripped layout, a working teleprinter circuit and a demonstration of morse code training methods.

*65th Signal Regiment T.A., 79/85, Worship Street, London, E.C.2.*

#### TETRA ENGINEERING (N7)

Metal-sheathed embedded heating elements for domestic, industrial and commercial applications. A new product on view this year is a 2½ kW kettle element.

*The Tetra Engineering Co., Ltd., Tetra Works, North End Road, Wembley, Middlesex.*

#### TEXAS INSTRUMENTS (U4)

Industrial silicon, silicon and germanium transistors; silicon diodes and rectifiers, and tantalum capacitors. The germanium power transistors shown have collector ratings up to 80 V, while silicon zener power regulators have nominal zener voltages from 15 to 150 V and a power dissipation of 8 W at stud temperatures up to 50°C. New products include industrial silicon transistors for medium-power applications, tantalum capacitors with working voltages from 6 to 35 V and a capacitance range from 1 to 330 µF, and a silicon diffused power transistor with a saturation voltage of 1 V at 2 A.

*Texas Instruments, Ltd., Manton Lane, Bedford.*

#### THERMAIR DOMESTIC APPLIANCES (S6)

The domestic appliances on view include a clothes dryer, the "Panorama" fire incorporating curved re-

flectors and infra-red elements giving almost a 180° heat spread, and the "Corona" "Heat-n-Light" circular 750 W heating element incorporated with a ceiling light fitting.

*Thermair Domestic Appliances, Ltd., Izons Lane, off Oldbury Road, West Bromwich, Staffordshire.*

#### THERMALAY (N8)

Electrically heated carpet underfelt. The range of carpet underlays exhibited comprises 14 sizes from 6ft by 6ft to 15ft by 9ft with electrical loadings from 322 W to 1,150 W and two 36in wide strips 9ft and 12ft in length rated at 218 W and 322 W respectively. In addition, heat controllers, thermostats and pilot plugs with neon lights are being shown.

*Thermalay, Ltd., Shelf Mills, Shelf, nr. Halifax, Yorkshire.*

#### THERMAT (J20)

Electric blankets. See H. J. Baldwin & Co., Ltd.

*Thermat, Ltd., Baldwin House, 132, Arkwright Street, Nottingham.*

#### THERMODARE (H22)

Rewireable floor warming equipment, night storage heaters and industrial and domestic infra-red heaters. The range of off-peak night storage heaters shown includes units rated at 1, 1½, 2 and 3 kW, industrial infra-red heaters available with loadings from 100 W to 4 kW, and the "Warm Wave" series of domestic infra-red heaters which are intended for wall fixing and now have a built-in double-pole 5 A pull switch. These are available in 750 W and 1 kW versions.

*Thermodare (Great Britain), York Mansion, 94-98, Petty France, London, S.W.1.*

#### THEMODUCT (Q2)

Industrial and domestic floor heating, panel and fan heaters, electrode hot water boilers, and packaged central heating units. In conjunction with their associates, H.V.E. (Electric), Ltd., this company is showing a full scale model of a typical electric floor heating installation, comprising cables laid in preformed ducts in a concrete floor. Also displayed are the "Unipak" packaged central heating unit, electrode hot water boilers, circulator boilers, electric panel and fan heaters, and equipment for the conversion of existing boiler heating plant to electric power.

*Thermoduct, Ltd., Viaduct Works, Kirkstall Road, Leeds, 4.*

#### THERMOSTATIC CONTROLS (J6)

See Controlled Heating Units (London), Ltd.

*The Thermostatic Controls Co., Avenue Road, Hampton, Middlesex.*

#### F. W. THORPE (F13)

Industrial and commercial lighting equipment. Among the equipment for fluorescent lighting are heavy and light

wiring trunkings including the "Slydalong" system for flexible layouts, vitreous or stove enamel unit type troughs with detachable reflectors, corrosion-, weather- and dust-proof units, adjustable bench lights, metal or plastic louvres and clip-on glass or Perspex covers. Tungsten lighting equipment and a complete range of products for mercury discharge, fluorescent discharge and sodium lighting are also shown. New products include a galvanised universal trunking system with provision for up to four cable ducts, 14 and 15in diameter angle reflectors in the "Thoroseal" anti-corrosive range, and a high bay lighting unit for a 1,000 W MBF/U lamp.

*F. W. Thorpe, Ltd., Welby Road, Hall Green, Birmingham, 28.*

#### TINTOMETER (Y4)

Visual colour measuring instruments for oils, paints, pastes, plastics, etc. The principal exhibit is a Lovibond Schofield "Tintometer" for measuring the colour of signal lights and signal glasses, lamp caps, cathode ray tube screens and other self-luminous bodies, and also for the measurement of colour temperature of light sources and their colour rendering properties.

*Tintometer, Ltd., Waterloo Rd., Salisbury, Wilts.*

#### TOOLPRO (H6)

High grade precision tools.

*Toolpro, Ltd., High Road, Ilford, Essex.*

#### TRICITY COOKERS (J16)

Domestic cookers and refrigerators. Those on view include the "Marquis," "Viscount" and "Popular" cookers and a built-in cooker unit. Prominently featured is the range of "Dinercold" refrigerators and the new "Kitchencold," "Kitchencold Junior" and "Dinercold Junior" refrigerators.

*Tricity Cookers, Ltd., Thorn House, Upper St. Martins Lane, London, W.C.2.*

#### TROUGHTON & YOUNG (LIGHTING) (H16)

Lighting fittings. On view are new ranges of fluorescent fittings including 4ft and 5ft single and twin lamp units and a 2ft twin lamp unit, all available as pendant or ceiling fittings and for continuous runs. Also on show are "Westinghouse" high output twin 8ft fittings for industrial and commercial use as batton, reflector and diffuser fittings.

*Troughton & Young (Lighting), Ltd., 143, Knightsbridge, London, S.W.1.*

#### TROUGHTON & YOUNG (MANUFACTURERS) (H16)

Control console and battery charger. Featured on this stand is a console having instrumentation and controls for one 6 kV and two 50 kV h.v. transformers and regulators for production cable testing. Also on view is a 136 V germanium and selenium battery

charger with automatic changeover from the charge to the float condition.

*Troughton & Young (Manufacturers), Ltd., Beddington Farm Lane, Croydon, Surrey.*

#### TRUNDUCT (G7)

Busbar trunking systems and rising mains. See G. P. Dennis, Ltd.

*Trunduct, Ltd., Fleming Road, Speke, Liverpool, 24.*

#### TUFNOL (D7)

See George Ellison, Ltd.

*Tufnol, Ltd., Perry Barr, Birmingham, 22B.*

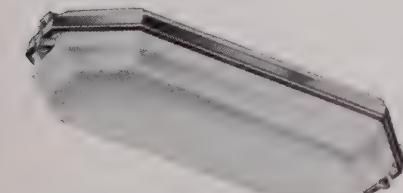
#### TURNER BROS. ASBESTOS (U9)

Asbestos textiles, "Duraglas" glass-tape, p.t.f.e. components and the "Poly-V" drive. The asbestos display includes examples of such applications as electrical cables, heating elements and stator winding insulation. Also shown is "Duraglas" glass fibre insulating tape using yarns of "E" glass with less than 1 per cent alkali content, standard and premium V-belts and the multi-vee "Poly-V" drive which reduces pulley width, increases horse power capacity, and maintains a constant effective pitch diameter at all loads.

*The Turner Brothers Asbestos Co., Ltd., P.O. 40, Rochdale, Lancashire.*

#### TURNERS ASBESTOS CEMENT (K26)

Electrical insulation materials for high temperature applications. These



Fluorescent bulkhead lighting fitting  
(Veritys (Maxlume), Ltd.)

include "Siluminite" synthetic resin bonded asbestos laminates and silicone resin bonded tubes and cylinders, in addition to standard electrical grade asbestos paper, tapes and tubes. "Sindanyo" natural grade electric arc and heat resisting asbestos boards and ebony grade electrical insulating board are also shown. New products for class "H" and class "C" applications include "Electrofine" asbestos paper impregnated with silicone resin and bonded either to leno weave open mesh glass cloth or close weave glass cloth.

*The Turners Asbestos Cement Co., Ltd., Trafford Park, Manchester, 17.*

#### TYER (W2)

Railway signalling equipment, electronic equipment and temperature and humidity control gear. Colour light signals, route indicators, circuit-

breakers, relays, repeaters, transformers, rectifiers and battery charging units form the exhibits concerned with railway signalling equipment. Also shown on this stand is a h.v. cable fault tester, a new automatic thickness comparator, high-speed counters and photo-electric control equipment. New products include the "Perram" resistance thermometer temperature controller.

*Tyer & Co., Ltd., Perram Works, Merrow Siding, nr. Guildford, Surrey.*

#### TYRAD ELECTRIC (H16)

Heating equipment. This company is showing a range of block storage heaters, together with rewirable and embedded floor warming systems, high temperature radiant panels, infra-red projectors and fan heaters.

*Tyrad Electric, Ltd., Imperial Court, 2, Basil Street, London, S.W.3.*

#### UCAN DEVELOPMENT (X16)

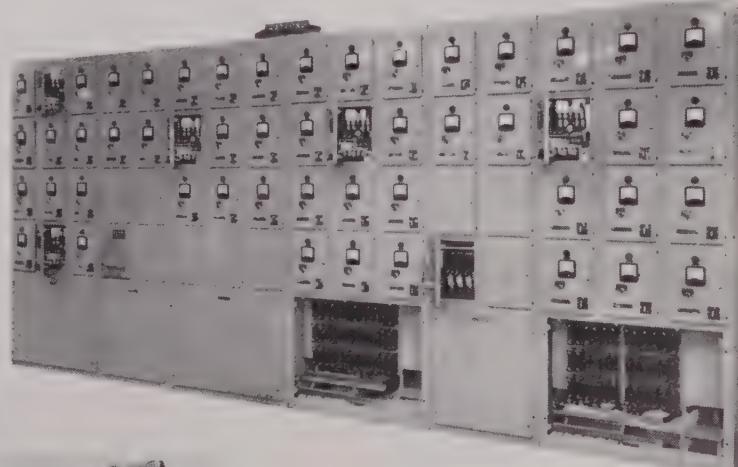
Fixing tools. The new "Hilti" DX500 cartridge-assisted tool is demonstrated.

*Ucan Development, Ltd., 62, Hill Street, Richmond, Surrey.*

#### UNI-TUBES (F4)

Kopex pliable electrical conduits and couplings; also p.t.f.e., unplasticised p.v.c. and high density polythene convoluted tubing, and p.t.f.e. unsintered wrapping tape.

*Uni-Tubes, Ltd., Alpha Works, Alpha Street, Slough, Buckinghamshire.*



Switchboard shown by the Watford Electric & Manufacturing Co., Ltd.



Flameproof lighting fitting with integral choke (Victor Products (Wallsend), Ltd.)



Thermodare "WarmWave" infra-red heater

#### UNIVERSAL INSTALLATIONS (X9)

Fixing tools, including the Phillips "Red Head" concrete anchor fixing device.

*The Universal Installations Co., Ltd., 65, Queen Street, London, E.C.4.*

#### VACTITE WIRE (L5)

Resistance wires and tapes in "Vactrom" (nickel-chrome) and "Eureka" (cupro-nickel) are shown, in addition to molybdenum rods, wires and tapes and nickel and Monel wires and tapes.

*Vactite Wire Co., Ltd., Linacre Lane, Bootle, Lancs.*

#### VANGUARD ENGINEERING (T9)

Lighting fittings and cable trunking. New products shown include circular lighting fittings, cable trunking and accessories. A fluorescent lighting trunking system is also displayed together with fluorescent control gear and accessories.

*The Vanguard Engineering Co., 193-201, Lee High Road, London, S.E.13.*

#### VARILECTRIC (J9)

Distribution and motor starter switchboards, distribution fuseboards, rising main busbar systems, and cable ducting and trunking. A cubicle pattern switchboard incorporating the new 26 MVA air circuit-breakers up to 1,600 A as well as fused switches, distribution fuseboards and instruments is featured. Multi-tier motor starter cubicles having combined draw-out

fused switch and direct-on-line starter units are also shown. The rising main busbar systems shown include miniature risers for up to 300 A, four-pole and overhead busbar systems with plug-in tap-off units.

*Varilectric, Ltd., No. 8 Building, 10, Melon Road, Peckham, London, S.E.15.*

#### VENNER (C9)

Time switches, electronic apparatus and accumulators. The new "Auto-point" portable time switch can be plugged into an existing socket and will repeat the switching programme each day. It is available with 15 A round pin plug or 13 A ring main type. The industrial electrically operated automatic reset timer type PT5 shown can be used as a delay relay or a rectifying process controller in addition to single operation process control. Other products shown include time switches for lighting, heating and industrial applications. A new compact time and frequency measuring equipment is being shown by Venner Electronics. Venner Accumulators are exhibiting lightweight storage batteries in packaged units.

*Venner, Ltd., Kingston By-Pass, New Malden, Surrey.*

#### VENT-AXIA (V6)

Ventilating fans, including intake, extractor and reversible types, together with iris shutters and ancillary equipment. Four sizes are available, covering up to 62,000 cu ft/hr.

*Vent-Axia, Ltd., 60, Rochester Row, London, S.W.1.*

#### VERITYS (MAXLUME) (A1a & E10)

Lighting fittings and motor control gear. Products shown include industrial lighting fittings; wellglass bulkhead and marine fittings; flameproof, vapourproof and dust-tight fittings and fluorescent fittings; also a.c. and d.c. motor and control gear.

*Veritys (Maxlume), Ltd., c/o 46, Coventry Road, Birmingham.*

#### V. G. PORCELAIN (F5)

Porcelain block connectors, porcelain and steatite insulating beads, h.b.c. fuse bodies, refractory pencil element bars, formers or bobbins and grinding media. A new product shown is a Bijou "Scrut" connector.

*The V.G. Porcelain Co., Ltd., Gorst Road, Park Royal, London, N.W.10.*

#### VICTOR PRODUCTS (K19)

Weatherproof and flameproof, and weatherproof and vapourproof lighting fittings. The "Circulume" chokes are now included in certain lighting fittings so that mercury-fluorescent lamps may be fitted with no other alterations to the installation. A new instant-start twin 12in, 8 W fitting with four-way entry and a new cast aluminium alloy fitting for two 2ft

tubular fluorescent lamps are also shown.

*Victor Products (Wallsend), Ltd., P.O. Box 10, Wallsend-on-Tyne.*

#### VOKES GENSPRING (H20)

Pipe and ducting support equipment. Support hangers for pipes and ducting are shown together with sway braces to protect large steam lines from shock or vibration, and "Genflex" bellows expansion joints.

*Vokes Genspring, Ltd., Henley Park, Guildford, Surrey.*

#### W. G. WALKER (K6)

Cable trunking, busbar systems, mains units, fuse boards, and accessories. A panel type dynamometer for electric motor testing is also being exhibited.

*W. G. Walker & Co. (Engineers), Ltd., Emery Hill Street, London, S.W.1.*

#### WALLACETOWN ENGINEERING (V4)

Motor control gear. A new product shown is a flameproof reversing gate end box for controlling Anbau Hobel coal ploughs. Other products shown include medium voltage "Wecol" air-break switch and control gear, industrial motor control cubicle switchboards in two, three, four and six tier formation, flameproof units, cable couplers, push-button units, remote control stations and cable couplers.

*The Wallacetown Engineering Co., Ltd., Viewfield Road, Ayr, Ayrshire.*

#### WALSALL CONDUITS (E6)

Wiring accessories, miniature circuit-breakers and industrial lighting fittings. New products shown include shaver units and the "Walrok" rocker bar switch. Also on view is steel conduit, switches, socket outlets, switched socket outlets and plugs including ironclad, weatherproof and dust-tight patterns. Cable trunking and underfloor ducting systems are displayed together with "Sparkless" mercury control units, bed lights and bedhead units for hospital installations.

*Walsall Conduits, Ltd., Excelsior Works, Dial Lane, West Bromwich.*

#### WANDLESIDE CABLE WORKS (R6)

Rubber and thermoplastic insulated wires, cables and flexibles. Lead-coated "Corrusteel" armoured cables for connection to railway track control apparatus, points, impedance bonds, track circuit feeds, etc., are featured. The "Spinner Wire Catenary Cable" for overhead suspension on poles and used for automatic warning signal and control circuits is also displayed.

*Wandleside Cable Works, Ltd., 106, Garratt Lane, Wandsworth, London, S.W.18.*

#### WANDLESIDE WARREN WIRE (R6)

High temperature operating cables. Wires and cables using p.t.f.e. as a basic dielectric are shown together with

p.t.f.e. glass fibre laminates in the form of tapes, cloths, and boards.

*The Wandleside Warren Wire Co., Ltd., 106, Garratt Lane, Wandsworth, London, S.W.18.*

#### WANDSWORTH ELECTRICAL (E12)

Wiring accessories including switch sockets, and incinerators. Sparkless switches and switch sockets are shown together with "Bunnie" and "Warden" incinerators. New products shown include 13 A switch sockets and neon switch sockets with metal plates and dollies.

*The Wandsworth Electrical Mfg. Co., Ltd., Albert Drive, Sheerwater, Woking, Surrey.*

#### WATFORD ELECTRIC (H11)

Motor control and switchgear. A new switchboard shown has the starter assembly mounted on a hinged door. Automatic airbreak switchgear is displayed, also contactor assemblies for capacitor switching, Ward-Leonard controls, and a 3.3 kV contactor cubicle suitable for direct switching motors up to 1,000 h.p.

*The Watford Electric & Manufacturing Co., Ltd., Whippendell Road, Watford, Herts.*

#### WATLIFF (K23)

Commutators and slip-rings in moulded and built-up constructions.

*The Watliff Co., Ltd., Lombard Road, Morden Road, London, S.W.19.*

#### WELBECK TRADING (F18)

Pre-packed electrical items. Over 100 items in "Welpac" transparent packs in which each item is clearly priced and numbered are displayed.

*Welbeck Trading Co. (London), Ltd., Welbeck House, 2-6, Baches Street, City Road, London, N.1.*

#### WESTINGHOUSE BRAKE & SIGNAL (G10)

Rectifying equipment. The rectifiers shown include "Westalloy" copper-oxide units; "Westalite" selenium, germanium and silicon power diodes; and high power "Trinistor" silicon switching devices. The complete equipments on view include low voltage heavy current electro-chemical process supply units, industrial medium voltage equipments and a 1,000 kW silicon traction rectifier for use on multiple-unit stock.

*The Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.*

#### WESTWOOD SWITCHGEAR (H2)

Industrial cubicle switchboards. Examples are shown of "Unit Assembly" industrial cubicle switchboards with an integral wiring chamber. These can be fitted with indicating and summation meters, oil and air circuit-breakers, contactors, distribution boards and metering equipment. Single units partially dismantled show the operating

mechanism, interlocks, chassis mounting and the removable carriage.

*Westwood Switchgear, Ltd., 22, Gorst Road, London, N.W.10.*

#### WHIPP & BOURNE (MIS)

Medium voltage switchgear. A type "AH" 3·3 kV air-break switchgear cubicle embodying a 150 MVA air-circuit-breaker is being shown in addition to a switchboard containing type IFA 2,000 A air circuit-breakers certified for 31 MVA at 415 V.

*Whipp & Bourne, Ltd., Castleton, Rochdale, Lancashire.*

#### WILLIAM WHITE (SWITCHGEAR) (J19)

Switchboards, power supply panels and distribution boards. The exhibits include switchboards and distribution equipment for H.M. ships, h.f. furnace switchgear, rising main systems, and distribution equipment for office blocks, and power supply panels for communication equipment.

*William White (Switchgear), Ltd., 368, Coldharbour Lane, London, S.W.9.*

#### WIMBLEDON TECHNICAL COLLEGE (O14)

Experiments illustrating the work of the College. The equipment used includes a high voltage surge generator, digital computer circuit elements, servo-mechanisms and radio and electronic circuits.

*Wimbledon Technical College, Gladstone Road, London, S.W.19.*

#### WINFIELD SMITH ENGINEERING SUPPLIES (Q1)

See William Miller (Newcastle), Ltd.  
*Winfield Smith Engineering Supplies, Ltd., 14, Great Smith Street, London, W.1.*

#### WIRE PRODUCTS (F15)

Cut wires, precision pins, special rivets and electronic components. The exhibits on this stand include cut wires such as copper rotor bars, resistor cap and lead assemblies, components for transistors and other semiconductor devices, and self-straightening draw wires. Also on view are precision pins and special rivets including one, claimed to be the smallest in the world, with a diameter of only 0·002in. This can be viewed through the "Sterimag" stereoscopic microscope.

*Wire Products & Machine Design, Ltd., Kingsbury Works, Bridge Road, Haywards Heath, Sussex.*

#### WIREOHMS (UNIVERSAL) (J20)

Domestic and industrial electric heating elements. See H. J. Baldwin & Co., Ltd.

*Wireohms (Universal), Ltd., Bunny, Notts.*

#### A. C. WITHNELL (Y1)

Electric vehicle control gear and charging equipment. A full range of battery chargers, rectifiers, and am-

meters of the clip-on induction type are displayed. New products shown include a high rate automatic battery charger.

*A. C. Withnell, Ltd., 163, Stanwell Road, Ashford, Middlesex.*

#### WODEN TRANSFORMER (J10)

Transformers for power distribution and electronic equipment. Exhibited are examples from a range of transformers for power distribution up to 5 MVA including special low-loss transformers for rural distribution, transformers for arc resistance furnaces, and smaller transformers for electronic equipment.

*The Woden Transformer Co., Ltd., Oxford Street, Birston, Staffs.*

#### E.W. WORKS (S5)

See J. Engl, Ltd.

*E.W. Works, Ltd., Bennett Street Industrial Estate, Bridgend, Glam.*

#### YORKSHIRE SWITCHGEAR (G17)

High voltage switchgear. On show for the first time is a 33 kV 1,000 MVA

fault-making, load-breaking oil switch, which can be isolated and is fully interchangeable with the company's 33 kV oil circuit-breaker. A main switch, feeder earthing switch and feeder testing facilities are incorporated, all fully interlocked. The switch has been tested and certified to B.S. 2631: 1955 at both 750 and 1,000 MVA and has been subjected to the load breaking tests associated with a rated current of 600 A. In addition there is a 33 kV 1,000 MVA type HI-VE 18 metalclad oil circuit-breaker and an 11 kV 250 MVA type IVIF-13 indoor metalclad oil circuit-breaker unit.

*Yorkshire Switchgear and Engineering Co., Ltd., Meanwood, Leeds, 6.*

#### ZENITH ELECTRIC (W13)

"Variac" transformers, tubular rheostats, insulation testing equipments, a single-phase meter test set, phase shifting transformers, automatic voltage regulators, and "Ceramite" wire-wound embedded resistors.

*The Zenith Electric Co., Ltd., Zenith Works, Villiers Road, Willesden Green, London, N.W.2.*

## CATALOGUES AND LISTS

**CONTACTORS.**—Illustrated pamphlet giving particulars of contactors intended for the control of lighting and heating installations.—*Santon, Ltd., Somerton Works, Newington, Mon.*

**CONTROL EQUIPMENT.**—Brochure giving information on pumping control equipment for such applications as land drainage, sewage plants, water supply and oil pumping.—*Dewhurst & Partner, Ltd., Inverness Works, Hounslow, Middlesex.*

**COOLING TOWERS.**—Brochure describing a new range of low head cooling towers designed for small industrial duties such as air conditioning and refrigeration.—*Head Wrightson Processes, Ltd., 20/24, Old Street, London, E.C.1.*

**CREEP TESTING.**—Illustrated brochure dealing with creep testing machines, furnaces and extensometers produced by the company.—*Nash & Thompson, Ltd., Tolworth, Surrey.*

**DOMESTIC CENTRAL HEATING.**—Leaflet describing a completely automatic electric central heating boiler suitable for use in domestic premises.—*Santon, Ltd., Somerton Works, Newport, Mon.*

**ELECTRIC FURNACES.**—Brochure giving particulars of shaker hearth furnaces.—*Eco Furnaces, Ltd., Queens Road, Weybridge, Surrey.*

**FASTENING DEVICES.**—Illustrated 84-page catalogue dealing with "Spire" speed nuts and the company's range of spring steel fastenings. Typical applications of use in the electrical manufacturing and other industries are shown.—*Simmonds Aerocessories, Ltd., Treforest, Pontypridd, Glam.*

**FIRST AID.**—Booklet giving details of the latest First Aid Regulations, together with descriptions of suitable first aid outfits.—*Cuxson, Gerrard & Co., Ltd., Oldbury, Birmingham.*

**FUSES.**—Booklet by G. F. Redgrave entitled "Notes on Fusing."—*Belling & Lee, Ltd., Enfield, Middlesex.*

**INSTRUMENTS.**—Catalogue (12 pages) giving information on pH meters for laboratory, industrial and medical uses, etc.—*Electronic Instruments, Ltd., Richmond, Surrey.*

**INSULATING MATERIALS.**—Leaflet containing the names and addresses of manufacturers of silicone electrical insulating materials and one giving a selection of firms producing articles using "Silastomer" silicone rubber.—*Midland Silicones, Ltd., 68, Knightsbridge, London, S.W.1.*

**LAMPS.**—Illustrated catalogue covering the range of "Ascot" tungsten filament lamps and fluorescent tubes.—*Ascot Lamps & Lighting, Ltd., Arcola Street, London, E.8.*

**NUCLEAR MONITORS.**—Pamphlet describing various items of nuclear health equipment, including hand and clothing monitors, and contamination monitors.—*E.M.I. Electronics, Ltd., Blythe Road, Hayes, Middlesex.*

**POWER PLANT.**—Brochure on Lister Blackstone mains failure standby generating plants designed for use in hospitals.—*R. A. Lister & Co., Ltd., Dursley, Gloucestershire.*

**RECTIFIERS.**—Leaflet and price list covering a range of medium power silicon rectifier stacks.—*International Rectifier Co. (Great Britain), Ltd., Hurst Green, Oxted, Surrey.*

**VALVES.**—Brochure giving abridged data of the company's range of valves.—*English Electric Valve Co., Ltd., Chelmsford, Essex.*

**VIBRATORY SCREENS.**—Catalogue dealing with vibratory and reciprocating screens for an extensive range of separable materials.—*Saxon Engineering Co., Ltd., Royal Street, Fenton, Stoke-on-Trent.*

**WATER HEATERS.**—Price list giving the latest figures for the company's water heaters, etc., and a leaflet describing special tap and water controls for electric water heaters.—*Santon, Ltd., Newport, Mon.*

**WIRING ACCESSORIES.**—Illustrated 44-page catalogue covering the company's range of conduit fittings, plugs and sockets, and switchgear, etc., together with a separate 40-page catalogue dealing with weatherproof accessories.—*Clang, Ltd., Cricklewood, London, N.W.2.*

**X-RAY EQUIPMENT.**—Illustrated 32-page booklet (177/2) describing the "Micro-scan" X-ray analyser.—*Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.*

# LOWLANDS ELECTRICITY

## ANNUAL REPORT OF THE SOUTH OF SCOTLAND ELECTRICITY BOARD

THE maximum demand on the South of Scotland Electricity Board's system last year occurred on 15th December and was 2,036 MW, of which 364 MW was supplied by the North of Scotland Hydro-Electric Board. These figures are given in the Board's annual report for the year ending 31st December, 1960, published last Wednesday. By the end of the year the total installed capacity was 1,884 MW and during the year the first half of Kincardine power station was completed by the commissioning of the third 120 MW set. Other features of the Board's activities in 1960 were a net surplus of £415,000 from a total income of £49.3 million, and an increase of 65 MW in off-peak load. The 7.5 MW Falkirk power station was shut down and the fourth reactor at Chapelcross nuclear station was brought into commission.

### Construction

While, in general, satisfactory progress continued on the civil and building works and the erection of the conventional plant at Hunterston nuclear power station, work on the main pressure vessels and steam-raising units is behind the original programme and the first half of the station will not be on full power until the early months of 1963. The circulating water system, switching station and administrative offices were completed. The outer

sphere of reactor "A" pressure vessel was assembled inside the biological shield, and work proceeded on the inner shield. Four of the associated steam-raising units were raised to their plinths on the reactor structure.

The civil works associated with the extension of Braehead power station were completed and progress on plant items was generally in line with programme requirements. This extension provides for an additional 60 MW of plant for commissioning in 1961.

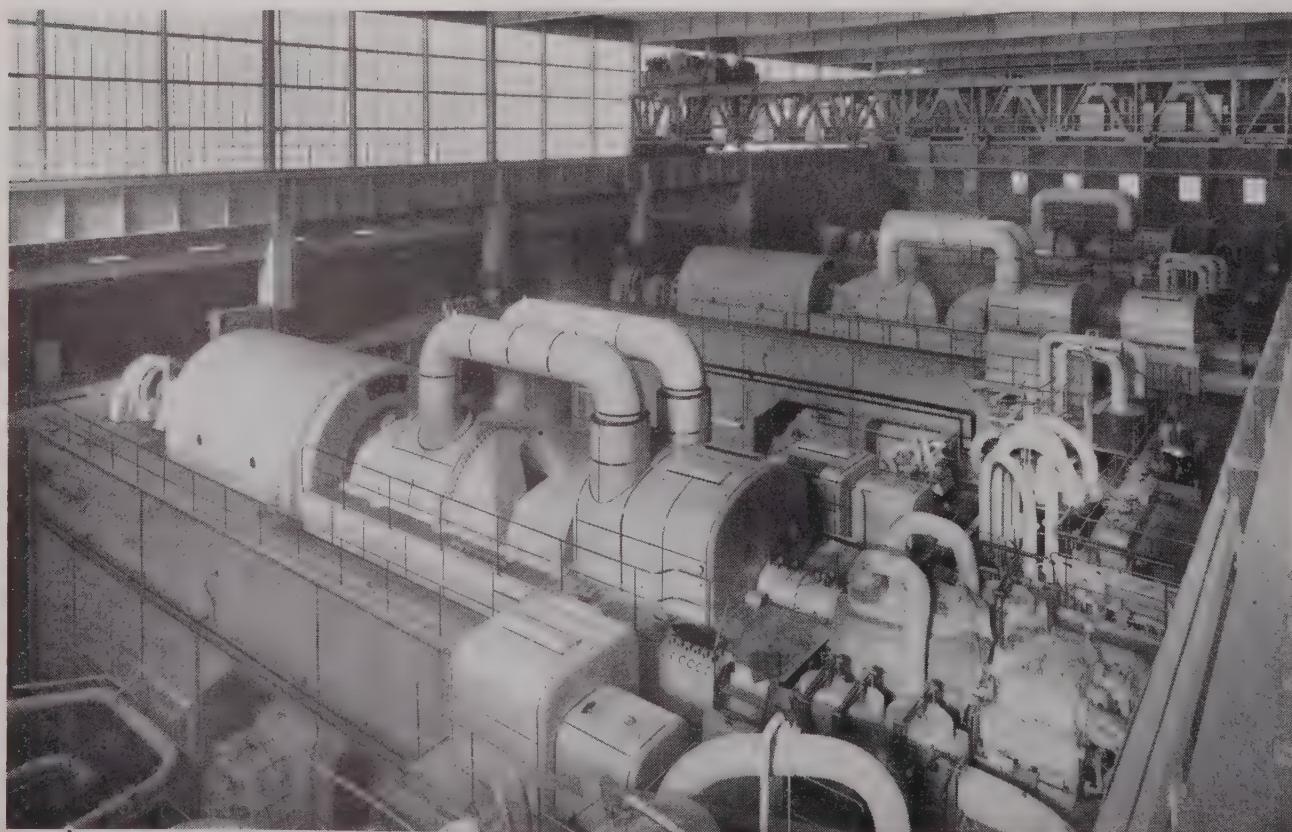
### Operation

About 2,846,000 tons of coal, 292,600 tons of washery slurry and 39,230 tons of coke breeze were delivered to the generating stations. These supplies came wholly from Scottish sources. The average thermal efficiency, excluding the slurry-burning station at Barony, was 27.27 per cent.

The stations with the highest thermal efficiency percentages in 1960 were Kincardine 33.39, Portobello H.P. 30.57, Dalmarnock H.P. 29.42, and Braehead 28.17. These four stations generated 68.4 per cent of the total energy sent out from steam stations.

The output of 313 million kWh from the Galloway and Lanarkshire hydro-electric schemes compares with an annual average of 303 million kWh. The civil works at

*The turbine hall in Kincardine power station, showing the three 120 MW sets*





Reactor A (right) and reactor B (left) under construction at Hunterston nuclear power station

the Lanarkshire scheme were surveyed by consultants and recommended repairs carried out. The condition of the works after more than 30 years' operation was considered satisfactory.

About 565 million kWh, including 43 million spill kWh, was imported from the North of Scotland Board and 96 million kWh supplied to them at off-peak times. The net import from the Central Electricity Generating Board was 207 million kWh. The net imports from the North of Scotland and from England represented 5.8 per cent and 2.6 per cent respectively of system requirements.

Imports from Chapelcross nuclear power station totalled 995 million kWh, 12.3 per cent of system requirements. Sundry other purchases amounting to 36 million kWh brought total supplies purchased to 1,031 million kWh, or 12.7 per cent.

### Transmission

Construction work proceeded as programmed on the 275 kV substations at Kincardine, Windyhill, Stanelymuir (Neilston) and Strathaven, and substantial progress was made on the erection of the overhead lines connecting these substations. Contracts were placed for high crossings over the Rivers Forth and Clyde and foundation work was commenced on the Forth crossing.

A major extension of the system to reinforce supplies in the city of Edinburgh was approved. The 275 kV substation at Kaimes will be extended and five miles of 275 kV double-circuit underground cable laid from that point to a new grid substation to be established at Dewar Place, Edinburgh.

To meet the growing load, extension and reinforcement of the 132 kV system was carried out. New substations were commissioned at Crookston, Elderslie, Hunterston and Kaimes, and extensions completed at Bonnybridge and Eccles. New supply points are to be provided at Coatbridge and Grangemouth and extensions made at Coylton, Glenniston and Saltcoats substations.

Single-phase supplies required for the first stage of the

Glasgow suburban railway electrification scheme were afforded from the 132 kV substations at Carntyne, Motherwell and Strathleven. The "Glasgow Electric" service from Airdrie to Helensburgh came into operation on 7th November, 1960. Work is proceeding on the supply to be given from the 132 kV substation at St. Andrew's Cross for the electrification scheme on the south side of the city.

Under the programme for the replacement of the conductors on the original 132 kV transmission lines, 58 circuit miles of conductors were restrung during the year. Since the commencement of this scheme in 1951, 57 per cent of the lines have been replaced, the major portion of the work being carried out by direct labour.

The mileage of the grid system is such that considerable time is occupied in the ground patrol and examination of overhead lines. With a view to reducing the time taken, a helicopter was hired on two occasions to fly staff along the routes of

the lines. The experiment was considered successful and this method of working is being further examined.

To keep pace with the growth of load, distribution systems throughout the district were extended and reinforced at a cost of £3.8 million. Increasing use was made of live line techniques in making new transformer and spur line connections to existing 11 kV overhead lines in rural areas, thus reducing the number of pre-arranged interruptions to supply. Automatic reclosing circuit-breakers continue to be placed at strategic points on the 11 kV rural network and the 151 units now installed have proved of great service in improving continuity of supply.

Energy sold to consumers totalled 7,153 million kWh, an increase of 11.2 per cent over the previous year. Weather conditions were near to normal, with lower temperatures

### FINANCIAL RESULTS

	During Year £	At 31st Dec. 1960 £
<i>Capital Expenditure</i>		
Coal-fired power stations ...	5,393,000	78,062,092
Nuclear power station (Hunterston) ... ... ...	10,146,046	30,560,117
Hydro-electric schemes ...	1,982	3,237,496
Transmission ...	2,963,447	21,728,787
Distribution ...	6,979,798	99,485,517
Sundry ...	436,654	6,065,500
Total ...	25,920,927	239,139,509
	1959 £	1960 £
<i>Revenue</i>		
Sales of electricity ...	40,224,000	44,643,000
Less (1) Interchange of electricity		
(a) North of Scotland Hydro-Electric Board ...	3,401,000	3,383,565
(b) C.E.G.B. ...	1,227,000	216,756
(2) Purchase of electricity		
(a) United Kingdom Atomic Energy Authority ...	601,000	2,451,254
(b) Other sources ...	121,000	73,736
Net electricity revenue ...	34,874,000	38,518,000
Contracting and sales of fittings...	4,797,000	4,656,000
Total ...	39,671,000	43,174,000
Trading surplus ...	97,000	415,000
Less depreciation of pre-1948 capital ...	—	500,000
Accumulated credit balance ...	637,000	552,000

and greater rainfall than in 1959. Domestic, farm and commercial sales rose by 14·7 per cent and industrial sales by 8·3 per cent. Some 16,236 new consumers were connected, bringing the total to 1,358,723. The industrial sales increase of 8·3 per cent compares with a 2·8 per cent increase in the previous year. About 38,106 kW of additional load was connected.

Many of the suggestions and designs put forward to industrialists by the Board's Advisory Service were put into successful operation. Considerable research was devoted to the preheating and stress relieving of large pressure vessels and to the application, and, in a number of cases, the introduction of electric heating for the drying of timber, paper, cloth, ceramics and linings for foundry ladles. The first low thermal mass "top-hat" electric furnace, which was originated by the Advisory Service, was set to work during the year and savings to the consumer in running costs will enable the capital cost to be recovered in the first year of operation. Colvilles, Ltd., are installing a 25 MVA, 80 ton electric arc furnace at their Hallside Works, Cambuslang. This will be the largest electric steel furnace so far installed in Scotland.

A further 321 farms were connected and 94 per cent of all farms in the district are now on supply or in process

of being connected. Efforts towards developing the use of electricity on the farm were intensified and progress was made particularly in the field of grain drying; climatic conditions have emphasised the importance of this development which forms a useful off-peak load. Research continued on various aspects of grass and grain drying and in the use of storage brooders for chicken raising. Talks and film shows were given to farmers' clubs and associations and agricultural college students and displays were arranged at the majority of the agricultural shows. A conference of commercial growers was also sponsored. The average annual consumption on farms rose from 9,675 kWh in 1959 to 10,557 kWh in 1960.

Considerable progress was made in the development of off-peak uses of electricity in domestic and other non-industrial premises. About 15,000 local authority houses with electrical floor warming and water heating are connected or under construction, including blocks of twenty storeys in Glasgow and in Edinburgh. Forty-seven local authorities have in hand the construction of dwelling houses entirely dependent on electricity. It is also of particular note that in South Scotland 287 schools, either built or under construction, use or will use off-peak electricity for space and water heating.

## REFRIGERATION INDUSTRY LUNCHEON

THE Rt. Hon. F. J. Erroll, P.C., Minister of State, Board of Trade, was the principal guest at the annual luncheon of the British Refrigeration Association at the Connaught Rooms, London, on 10th March. Mr. C. M. Marks, chairman of the Association, presided and proposed the health of the guests. Before doing so, however, he referred to some of the activities of the Association's Council during the past year. He said that two similar refrigeration exhibitions had been planned for 1961. The Council had tried to get the parties concerned to arrange an amicable settlement and they had managed to get one of them to withdraw. The B.R.A. had agreed that a biennial exhibition was desirable and it had decided to sponsor a representative exhibition itself in April, 1962. They had arrived at a much better understanding with the three sections of the frozen food interests and had agreed on a common policy. The British Electrical and Allied Manufacturers' Association had started a domestic refrigeration section. Following meetings between the Association and representatives of the B.E.A.M.A. assurances had been received that there was no intention of depriving the B.R.A. of any part of its right and that there would be the fullest co-operation.

After a reference to the Association's co-operation with the European refrigeration body, Mr. Marks said that domestic refrigerators and display cases which owed no allegiance to any standard recognised in this country had been imported. They had persuaded the Government of the necessity for an Order requiring all such equipment to be clearly marked as being of foreign manufacture.

Since the war the industry had produced about £450 million worth of equipment of which nearly 40 per cent had been exported. The biggest and fastest growing side was the domestic refrigerator; in the same period the production had been worth about £230 million and 44 per cent

of this had been exported. Instead of being helped by the Government the industry had been bedevilled by changes in hire-purchase and credit restrictions and purchase tax. He appealed to the Government to consider them as an industry which had "delivered the goods" and could do even better if properly treated and consulted. Mr. Marks concluded with an appreciation of the work of the director (Mr. T. Whittaker).

Responding for the guests, Mr. Erroll said that although 1960 exports of domestic refrigerators were 15 per cent above those of 1959 they were lower than in the two preceding years. There was an increase in exports of commercial refrigeration equipment. These better export results were an encouraging response to the Government's call for a really big export effort from British industry. While it was true that a large and steady home market helped to reduce overheads and hence selling costs, without a vigorous export trade we could not have a steady home market. As world trade barriers were being removed the distinction between home and export markets was becoming steadily less and some flourishing export industries had hardly any home market.

Mr. Erroll pointed out that, however unpopular they were, measures of restraint to protect our balance of payments could not be avoided.

In the past two years imports of domestic refrigerators had greatly increased. It had been suggested that we ought to cut down imports of some of these so-called inessential consumer goods but we could not expect other countries to let our products in if we kept theirs out.

At the annual general meeting of the Association last Friday, Mr. N. F. T. Saunders (Kelvinator, Ltd.) was elected chairman and Mr. R. H. Hemmings (York Shipley, Ltd.) vice-chairman.

# B.E.A.M.A. AT WORK

## FIFTIETH ANNUAL REPORT 1960-61

The fresh approach being made by the British Electrical and Allied Manufacturers' Association to many of the industry's affairs is already beginning to show results. In their golden jubilee report the Council look back on a year of "further expansion against a background of change and in the face of obstacles, some of which have yet to be completely overcome"

**I**T is characteristic of the new outlook of the B.E.A.M.A. that the Association's golden jubilee "will be marked throughout 1961 by many practical ways of assisting the industry's efforts and by this means making a contribution to national economic progress." Particular attention is being given to the export drive. A collective exhibit of domestic appliances was held at the Cologne Fair last month. An export conference for the whole electrical and allied industry will be held in October and a new electrical export directory is to be issued with a reference section in five languages and a circulation of 15,000 copies to overseas buyers. The culmination of the celebrations will be a dinner on 31st October at which it is hoped the Prime Minister will be the guest of honour.

For electrical manufacturers (the report states) 1960 was marked by intensification of the changes which have been strongly influencing the development of the industry in recent years. Technical achievements and the increased pace of technological advance are radically affecting the structure of many sectors, such as power generation; changes in Government policy, notably on nuclear power, railway modernisation and consumer goods, have sharply impinged on production programmes; and changing commercial conditions, brought about in some measure by the monopolies legislation, have been accompanied by groupings and amalgamations which have had an effect on the structure of the industry as a whole.

"Each of these factors is important in itself, and together they present far-reaching implications for the industry. Their impact has emphasised the important functions of the B.E.A.M.A. in keeping the industry together, providing the organisation for the exchange of information and statistics, co-ordinating views and formulating a common policy for discussions with the Government and other organisations at home and overseas. The B.E.A.M.A. is also giving increasing practical assistance to its members in those fields where central services can be provided most economically and effectively."

### Production and Research

Preliminary figures indicate that the volume of the industry's output rose by 7 per cent in 1960 and the value was over £1,600 million. Employment in November, 1960, was, at 795,000, over 30,000 higher than a year

earlier. Apart from the consumer goods side (which was severely hit by changes in credit control) nearly all the main sectors of the industry maintained or increased their output. In particular, production of turbo-generating plant reached a new record of 5,146 MW, of which 1,871 MW (or 36 per cent) was exported. Nevertheless, in every sector of the industry "keen competition prevails and profit margins are likely to remain under severe pressure."

The B.E.A.M.A. is giving increasing attention to public relations because it believes that a public opinion that is fully informed of the industry's contribution to the national economy is important today when Government policy has a major influence on the affairs of industry.

It is estimated that more than £64 million a year is spent in the electrical and allied industries on research and development, and "expenditure of this magnitude can only be supported by large-scale and profitable production programmes." In the course of the last few years more than £15 million has been spent on specialised facilities for railway electrification alone; and it has been estimated that research and development account for about 30 per cent of all nuclear energy costs. It is all the more unfortunate, the report states, that in both these fields manufacturers, after expanding their capacity to meet the requirements of the original schemes, have been faced with uncertainty and a reduced construction programme.

### Record Exports Again

Exports of the electrical and allied manufacturing industries at £293 million exceeded the record level achieved in the previous year (£285 million) and represented 10 per cent of the total export of manufactured goods from the United Kingdom. In terms of the "balance of trade," however, this increase was more than offset by a rise of £14 million in electrical imports. The total value of these imports represented for the first time for many years 20 per cent of Britain's electrical exports.

With the moves towards European integration that will give some of the industry's chief Continental competitors a larger market, a substantial and stable home market, with opportunities for gaining experience in advanced systems, is considered even more important as a base for successful exporting. It is estimated that there is an export potential of £190 million in railway electrical equipment alone in the near future.

The Commonwealth countries continue to be the industry's main customers, and Australia and New Zealand together purchased more than 13·5 per cent of the exports. Turbine exports reached the record figure of £17·7 million—20 per cent more than in 1959—and a third of these went to North America, including sets of 200 MW and 300 MW. The heavy engineering side of the industry accounted for a third of the total exports.

The international tariff discussions under the G.A.T.T. were the subject of a meeting last August between the Export Panel, B.E.A.M.A. section chairmen and the Board

of Trade. As a result, the Government representatives were given a working brief of the views of member firms. The Export Panel is also to issue shortly a booklet designed to provide members travelling abroad with a convenient summary of talking points about the British electrical and allied industries and the B.E.A.M.A.

Special attention has been given to European countries in view of their importance as developing markets, the report states. One of the most useful contacts has been through ORGALIME and decisions taken at these meetings have avoided a split between the "Six" and the "Seven" as far as the engineering trade associations are concerned. Agreement was reached at a meeting in Zürich in June of the Western European standards organisations whereby the "Six" and the "Seven" would collaborate as 13 countries in the alignment of Western European standards by the maximum development of European standards through the I.S.O., I.E.C. and C.E.E. The B.E.A.M.A. Council issued a policy statement giving strong support to these moves. It considers the industry's policy should be governed by the will to reach agreement and by a willingness to effect reasonable compromise.

### Section Activities

Much of the work of the sections during 1960, as in previous years, has been of a technical character such as the preparation of standards and examination of engineering problems of common interest arising in the course of manufacture. In addition, continuing co-operation between sections facilitates the exchange of information and co-ordination of views on all those problems which affect the well-being of complementary sectors of the industry.

Increasing attention is being paid in all the B.E.A.M.A. sections to a study of changing commercial conditions and the steps necessary to meet the challenge they represent. The need for accurate market information is clear and members of many sections, by voluntary co-operation, have demonstrated the value of an interchange of such statistics and data. The progress already made has emphasised the importance, the report states, of extending the range to give all members access to commercial information comparable to that available to electrical industries overseas.

Since the last annual report several new sections have been formed or have begun their work. The most recent development is the proposal to establish an Industrial Electronics Section, in order to provide an authoritative body within the B.E.A.M.A. on this subject. It will provide the means for closer discussions with other associations and help towards the wider examination of general policy questions affecting the industrial electronics industry as a whole. Similarly, the new Semiconductor Devices Section, which started work during 1960, is another reflection of the way in which the B.E.A.M.A. is adapting its organisation to developments within the industry. Other new sections are the Domestic Refrigerator Section and the Industrial Floor Cleaning and Maintenance Equipment Section.

During the year the Dynamo and Motor Section completed its report on the leading motor industries of Western Europe, with special reference to the repercussions of the setting up of the Common Market and the European Free Trade Association. Comparative data on standards and performance of foreign motors has emphasised the impor-

tance of avoiding the compilation of British Standards without reference to international practices. Consideration has also been given to the prospect of making a comparison of management ratios, and general ratios have been prepared for the consideration of section members.

As a result of discussions between the Transformer Section and the Electricity Boards about noise levels in transformers, a noise clause was accepted as a contractual obligation from 1st September, 1960, in B.E.B. specifications on transformers from 200 kVA to 100 MVA.

The Domestic Appliances and Information Divisions undertook the urgent task of preparing detailed information and statistics on the demand and current trading conditions in the industry to ensure that the Government was fully informed of the position. This has been followed up by continuing representations to the Board of Trade on the vital importance of a stable system of credit control at a modest level in order to maintain an efficient, competitive home industry. The Association continues to press the Government to adopt a 10 per cent deposit for major appliances, and to retain these arrangements without alteration for as long as possible.

As evidence of the progress achieved in keeping down costs, the report notes that the retail index for appliances, including radio and television (1956 = 100), stood at 88 in October, 1960, while the overall level of retail prices had risen to 111.

The establishment of the British Electrical Approvals Board for Domestic Appliances has meant that a considerable number of new British Standards for domestic appliances are required and the divisional technical panels are now working to a very tight schedule in order to produce appropriate drafts for consideration by the B.S.I.

Generally, the supply position of the major materials used in the industry has remained relatively easy, although individual companies have not been without special difficulties in regard to some purchases. The Materials Committee has made further progress in discussions with the major steel companies about the quality of cold reduced oriented electrical sheet for transformers. The chief points of discussion have centred on closer tolerances for the thickness of the sheet, closer control of permeability and reduction of waviness or "writhing."

### Export Sales Promotion

BRITAIN is in danger of losing its standard of living if its exporters do not wake up, states an export-promotion guide published by the Advertising Association. Mr. Roger Falk, chairman of the Marketing Development Co., Ltd., points out that, according to a recent survey, 30 per cent of Britain's exports of manufactured goods in 1958 came from only 40 firms. An apparently booming home market is insulating all but a small proportion of business men against the facts of Britain's trading life, states Mr. Falk. Britain's performance during the past decade leaves no room for self-congratulation. Since 1950 this country's share of world exports of manufactured goods has fallen from 25½ per cent to 16½ per cent. It is ironical, he says, that the new edition of the booklet should be just as appropriate now as when it was first published in 1956.

Other contributors deal with market research, selling methods, and the relationship between government and industry in the export field.

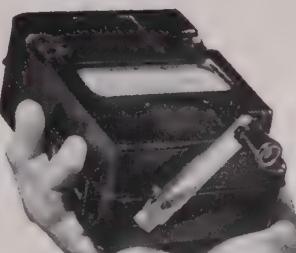
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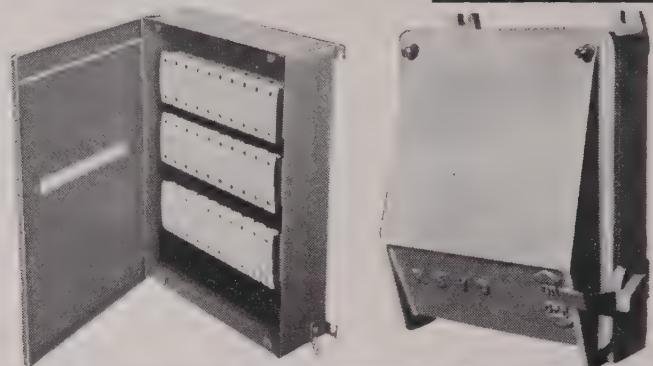
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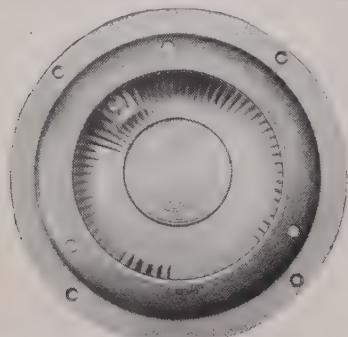


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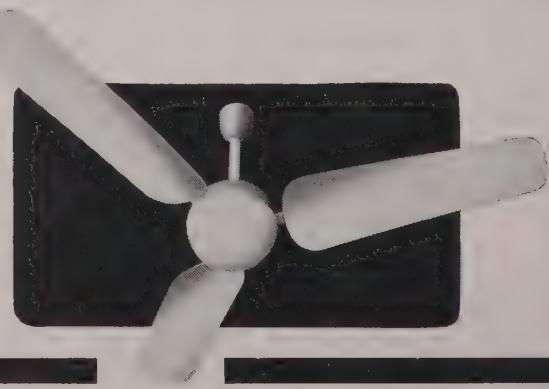


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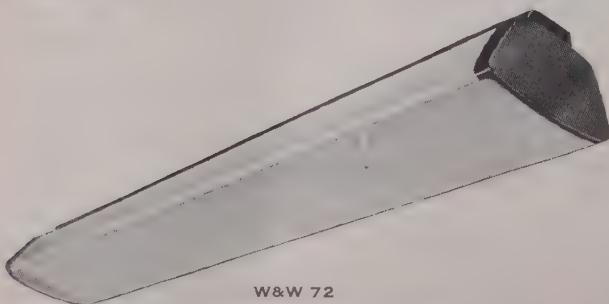


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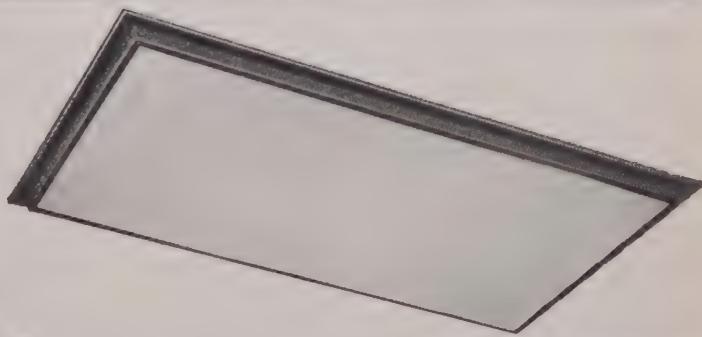


ELECTRIC COOKERS AND FIRES

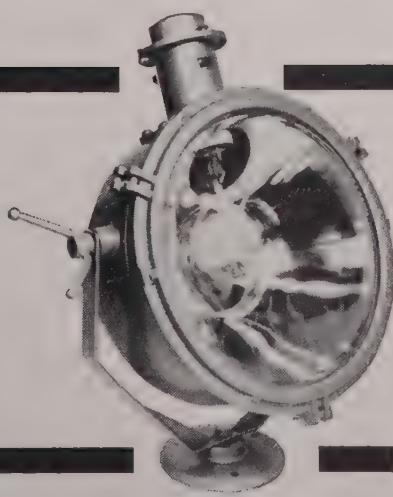


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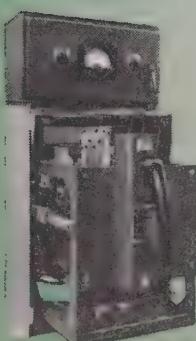
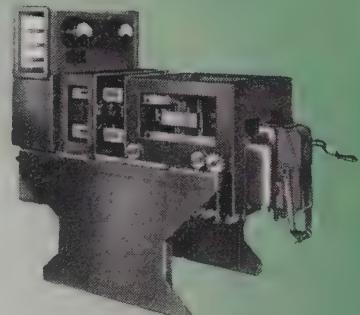
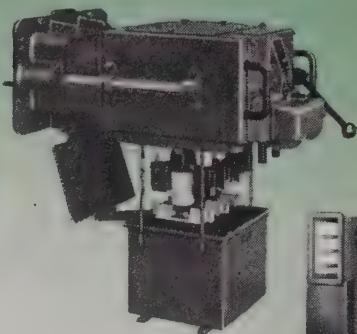
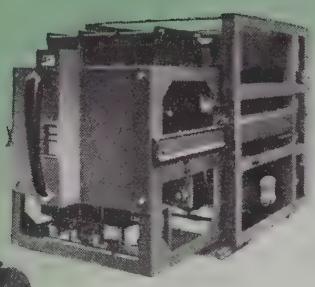
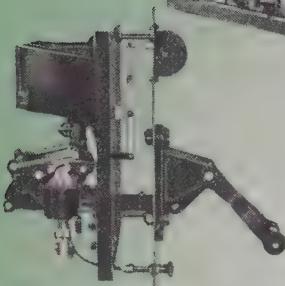


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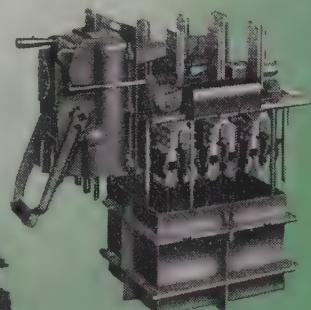
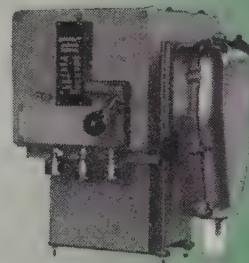
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# VIEWS on the NEWS

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By "REFLECTOR"

THAT export trade can be pursued successfully only if it is based on a sound home market has been accepted as an axiom for years. I suppose that it is still true for very many industries, but the Board of Trade seems inclined to doubt whether it can be generally applied. This was one of the points touched upon by Mr. F. J. Erroll at last week's luncheon of the British Refrigeration Association, which has hitherto believed that the "axiom" is true of its own industry. Mr. Erroll agreed that a large and steady home market tended to lower overhead costs and thus enabled prices to be reduced, but he contended that without a vigorous export trade there could not be a steady home market. This seems to suggest the possibility of lower home prices through successful export trade, but I should think that in present world market conditions the possibility is not immediate.

\* \* \*

"We have no time for such luxuries" was the reply I received from a leading domestic appliance manufacturer when I asked if the new models he was showing at a recent exhibition had been introduced as a result of market research into consumer requirements. But he later admitted that such studies could have their value when he told how a survey of the sales of an appliance already on the market revealed that this was being bought by a completely different section of the community from the one which had been expected to buy it. This haphazard attitude towards marketing is surely partly responsible for the seemingly unnecessary number of very similar appliances on the market and I have much sympathy with the demand expressed at the E.D.A. Sales Conference for more attention to basic design and quality and less to "gadgetry."

\* \* \*

At the annual luncheon of the Market Research Society, Lord Chandos, the new president, contrasted the attention that has been given to the development of mass production techniques, and such subjects as time and motion study, with the lack of a scientific outlook on marketing. The basic question, he said, was what does the buyer want? With quantity production it was just as important as an industrial or commercial objective, to develop the mass or quantity market as "to plan a factory with labour-saving devices, automatic machines and automatic control." Market research can be expensive and it has clearly suffered by being associated, in many people's minds, with public relations, doubts about which Lord Chandos thought might well be justified. His definition of market research as "trying to know what you are doing" gets to the heart

of the matter. As a first step it requires no more than the application of a little intelligent self-criticism, but in many cases even this could prove well worth while.

\* \* \*

*Late news?*—The New Zealand journal *Live Lines*, to which I am so often indebted, published in its 10th January issue a report which seems to have been a long time reaching New Zealand. It begins:—

"The British Minister of Transport, who is also chairman of the London County Council, in a recent article entitled 'The Electrical Revolution I Want' argues in favour of merging the Electricity Commissioners, the Central Electricity Board, the power companies, the joint boards, the joint electricity authorities, and the whole of the supply undertakings into one national electrical corporation which would be 'a public authority organising and directing the industry for public ends.' Underneath the national corporation he would establish regional boards to undertake 'aggressive consolidation and development of distribution.'"

The opening reference must be to Mr. Herbert (now Lord) Morrison who, however, was leader (1934-40), not chairman, of the L.C.C.

\* \* \*

A contemporary refers to the "Accumulated Manufacturers' Association." This, I suppose, is an outcome of the many mergers and take-overs which the industry has seen during the past few years.

\* \* \*

Eighty years ago, when the I.E.E. was still the Society of Telegraph Engineers and Electricians, a paper was read before it by Lieut. Cardew, R.E., on "The Application of Dynamo-electric Machines to Railway Rolling Stock." The *Electrical Review* of 15th March, 1881, reported as follows:—

"It was proposed to attach a dynamo machine to the axle of the driving-wheel of the locomotive of the train, and to pass the current generated through dynamo machines connected to the wheels of the carriages, these wheels would then be rotated by the current, and would give a more uniform motion than would be the case when the engine alone drew the train. By changing the connections, the current could be made to retard the wheels of the carriages, and thus to act as a brake. Mr. Alexander Siemens, Mr. C. E. Spagnoletti and Mr. G. K. Winter doubted the practicability of the scheme. Mr. R. E. Crompton thought the difficulties in adapting the scheme were by no means so great as the latter gentlemen seemed to think."

## LETTERS TO THE EDITOR

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.*

### Shavers on Tour

THE electric shaver is a boon at home but can be a nuisance on tour, especially abroad. Apart from a.c./d.c., there is the voltage problem, and the various "points" such as British and Continental sockets, b.c. and e.s. lamp-holders, requiring an array of connectors, apart from whether the shaver will operate on the available supply. There are battery shavers on the market and at first sight this seems to be the solution. But is it economical to have two shavers, only one of which is in use, when they are probably similar except only that one is wound for mains voltage and the other for about four volts?

Surely the solution is for a manufacturer to enter the market with a "battery shaver unit" comprising a case for two or three cells such as the U2, a vibrator to supply 50 c/s, and a transformer, separate or combined, to supply 240 V and a suitable current? Such a unit ought to be popular with anyone with an electric shaver who has to shave away from home at all. Of course, it must retail at less than the cost of a battery shaver. If used at home it would be a complete answer to the danger problem of using mains without a "shaver supply unit."

Sevenoaks, Kent.

E. H. W. BANNER.

### Evolution of Electromagnetic Machines

WE were, of course, very interested in the article in your current issue, since we have assisted in this evolution for the last 78 years. An interesting point is that young engineers today have the impression that the early machines were of ludicrously low efficiency. This was so in the

case of the dynamos designed by some of the "professors," but practical engineers in the 1880's succeeded in designing machines which had quite creditable performances.

Our price list of 1888 claims an electrical efficiency of 88 to 96 per cent, according to size. The prices are of interest; £30 for a 1.8 kW dynamo, up to £250 for a 30 kW machine. Inquiries were invited for machines up to 100 kW. These prices, converted to today's equivalents, may seem high, but it must be remembered that the machines were made by hand one at a time and painstakingly "run-in" at full load, with frequent stops for scraping bearings and bedding brushes; the price also usually covered a lot of service, training the customer's engine minder not to drown the whole thing in oil and to pay some attention to shifting the brush position with varying load so as to secure tolerable commutation.

London, W.C.2.

T. J. BARFIELD,

Publicity Manager,

Laurence, Scott & Electromotors, Ltd.

### I.E.E. North Western Centre

THE annual dinner of the North-Western Centre of the Institution of Electrical Engineers was held last week in the Midland Hotel at Manchester, under the chairmanship of Mr. F. Linley. Responding to the toast to the Institution, proposed by Sir Raymond Streat, Mr. O. W. Humphreys (vice-president, I.E.E.) said that the Institution drew much strength and wisdom from the local Centres and, to derive the maximum benefit, the lines of communication between these Centres and Savoy Place were being improved. He went on to say that the physicist of today was the engineer of tomorrow and the Institution had to cater for men who brought science into engineering. In ten years' time the power engineer and the electronics engineer would have joined forces and there was no doubt that by that time there would be someone else clamouring for recognition. Realising this, the Institution now admitted physicists on the same basis as "straightforward" electrical engineers. A toast to the guests was then proposed by the chairman and a witty response was made by Ald. Sir Richard Harper.

## C.E.G.B. ORDER FOUR MORE 500 MW SETS

CONTRACTS worth £33 million for the generating and boiler plant for another 2,000 MW power station for the Central Electricity Generating Board were announced on Monday. Four 500 MW single-line turbo-alternators and the associated feed heating plant and turbo-driven boiler feed pumps are to be supplied by C. A. Parsons & Co., Ltd., at a cost of £13 million, and Babcock & Wilcox, Ltd., will supply the boiler worth nearly £20 million.

Neither Parsons nor the C.E.G.B. will yet say where the new sets are to be installed. It is likely that the station will be on the East Midlands or Yorkshire coalfields where the Board has been studying sites for coal-fired stations. As reported in the *Electrical Review* of 3rd March, the English Electric Co., Ltd., is to supply the four 500 MW turbo-alternators and International Combustion, Ltd., and Simon-Carves, Ltd., the boiler plant for a 2,000 MW

station at West Burton. Another proposed station in the East Midlands, Holme Pierrepont, has been the subject of an inquiry, the result of which has not been announced.

The sets ordered from Parsons, which will be going into service in four or five years' time, represent an increase of more than 6 per cent in the total generating capacity at present installed in the United Kingdom.

Each of the four Babcock & Wilcox unit boilers will generate  $3\frac{1}{2}$  million lb of steam per hour at a pressure of 2,400 p.s.i. and a temperature of  $1,055^{\circ}\text{F}$ , with reheat to the same temperature. The boilers will be fired with pulverised coal and will be built in combination with Yarrow & Co., Ltd. The two companies have reached agreement over this contract to combine their resources "to make the most effective use of their respective technical and manufacturing facilities."

## PERSONAL AND SOCIAL

### *News of Men and Women of the Industry*

**Mr. J. E. Yates** has been appointed to the board of Lancashire Dynamo & Crypto, Ltd. (Metal Industries Group). He joined the Export Department of the company in 1952 when he returned to this country from Ceylon where he had spent three years working on the electrification of townships and tea and rubber factories. Last year his duties were extended from export manager to general sales manager. Mr. Yates, who received his technical education at the Manchester College of Technology, served in the Royal Navy during the war.

Crompton Parkinson, Ltd., announce the appointment of **Mr. M. P. Foley**, Associate I.E.E., to the board of their subsidiary company, Crompton Parkinson (Chelmsford), Ltd.

Mr. Foley has been associated with the company since 1923, and has covered all aspects of the switchgear business both at home and abroad.

**Mr. K. A. King-Smith**, A.M.I.E.E., has been appointed sales manager of the Control Gear Division of G.W.B. Furnaces, Ltd. He will be based at the company's Dibdale Works, Dudley. Mr. King-Smith was previously electrical project engineer with Francis Shaw & Co., Ltd., and has also held positions with firms specialising in automatic control gear and rotating machines. He served his apprenticeship with the General Electric Co., Ltd., Witton. **Mr. J. R. Byatt**, A.M.I.E.E., is appointed sales engineer, London area, and will cover South-East England and the Home Counties. He was previously with Honeywell Controls, Ltd., and Allen West & Co., Ltd. **Mr. C. Turner** is promoted from internal sales duties to the position of sales engineer, North East area, based at Sheffield.

Last week the G.E.C. Dramatic Society gave performances of "To Settle for Murder," by Stuart Ready. The cast of six are to be congratulated on making the best of a rather patchy

dialogue and a credulity-stretching plot. The players were Florence Scanlebury, Laurie White, Shirley Linge, Frederick Coker, Shirley Munn and John Browne and the producer was Phillip S. Cook. A donation from the proceeds is being sent to the Imperial Cancer Research Fund.

The first award of the Sir Walter Puckey prize was made to **Mr. L. C. Lambert**, Dip.Tech.(Eng.), at a meeting of the Wales Region of the Institution of Production Engineers, held at the Welsh College of Advanced Technology, Cardiff, on 10th March. The presentation was made by Sir Walter Puckey, past-president of the Institution.

**Mr. J. W. Atwell**, M.Sc., managing director of G. & J. Weir, Ltd., has been appointed a director of G. & J. Weir Holdings, Ltd.

Newey & Eyre, Ltd., have appointed **Mr. J. McKell** as chairman and **Mr. A. T. Hesmondhalgh** as managing director, following the recent death of the chairman and managing director, Mr. R. A. Corbett. Both Mr. McKell and Mr. Hesmondhalgh were already directors, Mr. Hesmondhalgh having been deputy managing director since 1959. **Mr. D. A. Ashton**, a director for the past ten years, will now act as sales director and **Mr. G. J. Yardley**, secretary of the company, has been appointed to the board as commercial director. **Mr. C. M. Field**, a director of Newey & Eyre, Ltd., for the past

14 years, has been appointed managing director of the Newey & Eyre Electrical Co., Ltd.

The Southern Rhodesia Electricity Supply Commission announces the appointment of **Mr. J. M. Magowan**, M.I.E.E., M.Rhod.I.E., M.(S.A.)I.E.E.,

as its general manager. Mr. Magowan, formerly on the staff of the Electricity Board for Northern Ireland, joined the Southern Rhodesia Electricity Supply Commission in 1939. He was appointed electrical engineer and head of its Electrical Department in 1944 and acting deputy general manager and chief executive officer last October. Mr. Magowan was educated at the Lisburn Technical High School and the Belfast College of Technology.

The Midlands Electricity Board has appointed **Mr. L. Harvey**, M.I.E.E., manager, Birmingham South East District, as manager of the Birmingham South West District in succession to **Mr. R. H. Rockliffe**, A.M.I.E.E., who, as previously announced, is to become Birmingham and District Sub-Area engineer. Mr. Harvey began his career with the Stoke-on-Trent Corporation Electricity Department in

**Mr. L. C. Penwill**, director and secretary of the Electrical Contractors' Association, speaking at the Torbay Electrical Group's annual dinner and dance at Torquay on 3rd March. Also in the picture (left to right) are Mrs. A. W. Allwood, Mr. A. W. Allwood (Torbay District manager of the South Western Electricity Board) and

Mrs. Penwill



Mr. M. P. Foley

1929, later serving with the Northampton Light & Power Co., and during the war with the Air Ministry as station engineer. In 1945 he returned to Stoke-on-Trent as mains engineer at Longton, and soon after the M.E.B. was formed he became district manager at Stone. In 1959 he was appointed district manager at Solihull and took up his present position in April last year.

**Mr. G. O. Romans, A.M.I.E.E.**, has been appointed engineer of the Board's Central Gloucestershire Sub-Area in succession to **Mr. Wilfred Hill, M.I.E.E.**, who is retiring on 26th April. The deputy sub-area engineer, **Mr. S. H. C. Morton, A.M.I.E.E.**, is also retiring and is to be succeeded by **Mr. R. H. B. Johnson, A.M.I.E.E.** Since 1958 Mr. Romans has been at M.E.B. headquarters as senior assistant engineer, responsible for primary system planning. Previously he was on the engineering staff of the Central Gloucestershire Sub-Area, and before nationalisation he served with the West Gloucestershire Power Co. and the Yorkshire Electric Power Co. Mr. Johnson began his career with the West Kent Electric Co. and served with the South Eastern and Yorkshire Electricity Boards before joining the M.E.B. as district engineer at Cheltenham in 1955. He is at present senior assistant, planning and operations, on the engineering staff at Gloucester.

Mr. Hill has spent more than 40 years in the electricity supply industry, mostly in Gloucestershire. Born at Crewe and educated at Harrow and the Imperial College of Science and Technology, he joined the Hereford Corporation undertaking in 1920 and from 1922 until vesting day he was with the West Gloucestershire Power Co., latterly as chief engineer. He is a former chairman of the Western Centre of the I.E.E.

Mr. Morton was educated at the Manchester and Salford Technical

Colleges. He served his apprenticeship at the Peel-Connor Telephone Works and was later with the Metropolitan-Vickers Electrical Co., Manchester Corporation Electricity Department and the West Gloucestershire Power Co. He took up his present position in 1952.

**Mr. Ivon A. Bailey** has been elected a vice-president and **Mr. John O. Hitchcock** an assistant vice-president of the International Nickel Co. of Canada, Ltd., as from 10th April. Mr. Bailey remains chairman and chief officer of the International Nickel Company (Mond), Ltd., and of Henry Wiggin & Co., Ltd., and Mr. Hitchcock managing director and deputy chairman, respectively, of the two companies.

Approximately 150 members and guests attended the March luncheon meeting of the **Electrical Industries Club** last Tuesday at the Connaught Rooms, London. Col. B. H. Leeson (president) was in the chair and the guest speaker was Lieut. Phibbs of the U.S.A.F. Office of Information. His subject, "Public Relationships," proved to be an interesting account of the way of life of the American forces in Great Britain.

The next luncheon meeting will be on 11th April and this will be preceded at 11.45 a.m. by the annual general meeting.

Congratulating the **Illuminating Engineering Society** on having a class of membership open to persons with no technical qualifications, Brigadier C. C. Parkman, who was the principal speaker at the annual luncheon of the Liverpool Centre, said this was an excellent balancing factor in these days when there was so much specialisation. Specialisation was necessary, indeed inevitable, but we should ponder and consider whether our wisdom was keeping pace with knowledge and technical developments.

Dr. W. S. Stiles, president of the I.E.S., spoke of the great lighting achievements in the city of Liverpool, among which he cited the lighting (interior or exterior) of the Cathedral, the docks lighting system, street lighting and the Mersey Tunnel. The Mersey Tunnel was the prime example of tunnel lighting in this country. He paid a tribute to Mr. C. C. Smith, the city lighting engineer and a past-president of the I.E.S.

On 31st March **Mr. Edgar Stott**, export sales manager of Turner Brothers Asbestos Co., Ltd., retires after 42 years with the company. His successor, **Mr. J. C. T. Fell**, was until recently export sales manager of Ferodo, Ltd., an associated company in the Turner & Newall organisation.



Mr. J. C. T. Fell

**Mr. L. Houldridge**, who is at present a commercial engineer with the Eastern Electricity Board at Peterborough, is leaving at the end of the month to take up new duties as a commercial engineer at the Board's Sub-Area headquarters at Milton Hall, Cambridge.

**Mr. J. Varley** and **Mr. G. H. Parr**, refinery manager and sales manager, respectively, of British Copper Refiners, Ltd., have been appointed directors of the company. British Copper Refiners, Ltd., is a wholly-owned subsidiary company of British Insulated Callender's Cables, Ltd.

**Mr. Maurice P. Gaffney, M.S.M.A.**, has been appointed by the Telephone Manufacturing Co., Ltd., as commercial manager, to co-ordinate the commercial activities of all divisions of the company. Before joining T.M.C. Mr. Gaffney was with the Phoenix Telephone & Electric Works, Ltd.

**Mr. J. A. Winchester**, at present manager of the Merseyside and North Wales Electricity Board's Conway Valley District, has been appointed manager of the Crewe District in succession to **Mr. A. D. Hegan, B.Sc., M.I.E.E.**, who retires in July. **Mr. J. L. Williams**, district manager at Aberystwyth, will shortly assume responsibility for the Board's Oswestry District on the retirement of **Mr. W. A. Williams**.

Mr. Winchester began his career with the Northmet Power Co. and later served with the Cornwall Electric Power Co. and the South Western



At the I.E.S. Liverpool Centre luncheon (left to right): Dr. W. S. Stiles (president, I.E.S.), Mr. C. C. Smith (chairman, Merseyside Electric Lighting Services Committee), the Lord Mayor of Liverpool, Mr. J. D. Ducker (hon. treasurer, Liverpool Centre, I.E.S.), Mr. P. A. Redmond (chairman, Liverpool Centre, I.E.S.), Mr. D. H. Kendon (chairman, Merseyside and North Wales Electricity Board), Brigadier C. C. Parkman and Mr. N. Blackman (hon. secretary, I.E.S.)

Electricity Board, before joining "Manweb" as a district commercial officer. He was appointed manager of the Conway Valley District in 1955. Mr. J. L. Williams joined the North Wales Power Co. in 1928 and after vesting day held various appointments on the "Manweb" commercial staff; he was appointed district manager at Aberystwyth in 1955.

**Sir Laurence Watkinson, K.B.E., C.B., M.C.**, who is chairman of the London Electricity Consultative Council, has been appointed to the Monopolies Commission as a part-time member. The appointment is for a term of three years from 8th March.

**Mr. Victor H. Devis** has rejoined Browning's Electric Co., Ltd., as manager of the company's Electrical Repair Division, after spending five years with Dowding & Mills, Ltd.

**Mr. L. J. Tolley**, at present works director of Renold Chains, Ltd., has been appointed a deputy managing director in addition to Mr. W. S. C. Tully. **Mr. E. E. Hempsall** becomes general works manager.

**Mr. Howard Hearne, A.M.I.M.E.**, has been appointed managing director of the Grubb Engineering Co., Ltd.

## OBITUARY

**Sir William Walker.**—By the death on 13th March of Sir William Walker, J.P., LL.D., M.I.E.E., M.I.Mech.E., the electricity supply industry loses

one who was active in its interests for a long period, although he has been in retirement for a number of years. He was 93. Sir William was prominent in Manchester's public life and was an alderman of the city for

many years and Lord Mayor in 1932-33. His electricity supply associations derived from his chairmanship of the Manchester Electricity Committee. He became president of the Incorporated Municipal Electrical Association in 1945-46 and he was one of the original members of the Central Electricity Board, on which he served until 1942. When the industry was nationalised Sir William was appointed a member of the British Electricity Authority and served in that capacity until 1952.

Sir William Walker was particularly



The late  
Sir William Walker

interested in salaries and wages. He was a founder member of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) and remained a member for about 33 years. He gave his name to the "Walker scale" which governed the salaries of power supply engineers. His public services were recognised by the bestowal of a knighthood in 1945 and for his work as a member of the council of Manchester University he received the honorary degree of LL.D.

For many years Sir William was a

director of Henry Simon, Ltd., and its associated companies.

**Mr. L. E. Fraser.**—The death occurred at Worthing on 6th March of Mr. L. E. Fraser, who was formerly sales manager, Electrical Sales Department, Bulpitt & Sons, Ltd. He was 69. Mr. Fraser retired in 1957 after 22 years' service with the company.

**Mr. W. J. B. Heath**, chief accountant of S. N. Bridges & Co., Ltd., died in Paddington Hospital on 1st March.

## PARLIAMENTARY REPORT

### Scottish Power Inquiry

Thirty-seven Scottish Labour M.P.s have put down a motion criticising the announcement by the Secretary of State, Mr. Maclay, that a decision will not be made on the Glen Nevis hydro-electric scheme until the Departmental Committee on the future of Scottish electricity has reported. Conservative back-benchers were quick to register their disapproval of this and have tabled an amendment to the Labour motion.

The Labour motion calls upon the Secretary of State to withdraw his declaration about the Glen Nevis scheme and asks him to add two trade unionists to the Departmental Committee to balance the representatives of employers. It also calls upon him to make clear that there is no intention of withdrawing powers given to the North of Scotland Board.

The Conservative amendment welcomes the inquiry into the economic and financial considerations inherent in the generation and distribution of electricity in Scotland, including generation by nuclear, thermal, water power, oil and wind methods. It suggests that the aim should be to provide supplies on terms and conditions yielding appropriate conservation of capital and fuel resources for both generation and distribution, the lowest available consumer tariffs and with suitable regard to the future security and employment of Scottish coal miners.

Mr. R. A. Butler said in the House of Commons last week that he could not guarantee time to discuss the motion but if the Labour members discussed the matter with Mr. Maclay they might find that there was not so much difference of opinion between them.

### Newcastle Electricity Breakdowns

The North Eastern Electricity Board was taking steps to strengthen the

distribution system in the Longbenton area of Newcastle, the Parliamentary Secretary to the Ministry of Power, Mr. J. C. George, stated in a written Parliamentary reply last week.

Mr. Fergus Montgomery had asked for a statement on two electricity breakdowns in Newcastle on 23rd February. Mr. George said that failure of supply between 4.39 p.m. on 22nd February and 2.30 a.m. on 23rd February had been caused by damage to one of the Board's feeders during street excavations by an outside contractor. A further breakdown in the same area which lasted less than two hours was caused by a cable failure which might have been related to the original failure. The Board was taking steps to strengthen the distribution system in the area.

### Experimental Nuclear Projects

Sir Richard Glyn asked the Parliamentary Secretary for Science last week what projects the United Kingdom was participating in under the auspices of the European Nuclear Energy Agency.

Mr. Denzil Freeth, in a written reply, said that these were the Dragon project at Winfrith Heath for the development of a high-temperature gas-cooled reactor and the Halden project in Norway for the development of a boiling water reactor. The United Kingdom was also co-operating fully in the general work of the European Nuclear Energy Agency through membership of specialist panels, committees and symposia. Mr. Freeth also said that the international board of the Dragon project had reported good progress in the assembly of staff. The first contracts for equipment had been placed and a start had been made on the construction of the experimental power-producing high temperature gas-cooled reactor. Satisfactory progress continued.

## INDUSTRIAL NEWS

### Approved Domestic Appliances

QUICKLY off the mark after the issuing of the first certificates, the British Electrical Approvals Board for Domestic Electrical Appliances (BEAB), 27, Cockspur Street, London, S.W.1, has produced its first list of approved appliances, dated 28th February. This details the 115 radiant fires, 44 kettles and 17 vacuum cleaners which meet the safety and reliability requirements of the appropriate British Standards and are thus qualified to bear the new approvals mark (see *Electrical Review*, 3rd March, p. 385).

The successful manufacturers are free to publicise the mark in relation to these appliances by the normal means of promotional advertising. No general publicity for the mark is being planned until the approved appliances reach the shops in some numbers. The list is being made available to dealers through their various associations. Limited supplies of the list are available for individual inquirers from BEAB. It is emphasised that the group scheme is a means of controlling applications and allowing each man-

ufacturer of a particular type of appliance an equal chance of applying for and, if successful, being granted approval. Now that the first group has been dealt with, applications for

the approval of radiant fires, kettles and vacuum cleaners can continue to be submitted. As each subsequent group is concluded, applications for approval of appliances of all previous groups will be dealt with. In this way, the manufacturer is given the opportunity to seek approval for his new models as they are developed, and to use the mark from their introduction to the market.

### E.L.F.A. President's Report

**I**N the course of his report for 1960, Mr. D. L. Tabraham (G.E.C.), president of the Electric Light Fittings Association, says that the first year of operation under the new constitution was successful and encouraging. A number of important companies had joined the Association and were playing an active part in its work. Although the membership now covers a very large proportion of the industry's turnover, E.L.F.A. has arranged one simple return of sales for 1960 to cover 27 additional manufacturers who are not members of the Association.

A special committee has been set up to help to promote export sales and to

watch the import position. Information about European markets and competitors is being collected and contact is being made with Continental lighting fittings makers' associations.

Among the technical activities being pursued is work on the drafting of a revised British Standard for street lighting lanterns. Public lighting engineers all over the world were sent copies of a booklet, produced with the assistance of the Association of Public Lighting Engineers, entitled "Guidance for Purchasers of Street Lighting Lanterns."

Mr. Tabraham refers to discussions and negotiations with other organisations and notes the purchase tax concession on fluorescent fittings secured from the Customs and Excise authorities.

At the Association's annual general meeting yesterday (Thursday), at which the report was presented, Mr. T. S. Jones (Crompton Parkinson, Ltd.) was appointed president. Messrs. L. A. Fickling (Linolite, Ltd.) and W. T. Souter (Holophane, Ltd.) were re-appointed chairmen of the Domestic Section and the Street Lighting Section, respectively, and Mr. T. Catten (Falk, Stadelmann) was appointed chairman of the Industrial and Commercial Section.

The annual luncheon was held on Wednesday last. A report will appear in our next issue.

### "TRINISTOR" RECTIFIERS

Following recent reductions in the prices of their silicon diodes, the Westinghouse Brake & Signal Co., Ltd., have announced substantial reductions, amounting in some cases to 50 per cent, in the prices of "Trinistor" silicon controlled rectifiers.

In addition a new range of "Trinistors," type CS32, with current ratings of 16 A and voltage ratings of 25-400 V, has been introduced and supplements the existing CS31 25 A range. Other sizes, both larger and smaller, are planned.



The new Plessey laboratory at Eastern Avenue, Romford

## ELECTRONIC IGNITION SYSTEM

A HIGH speed ignition system embodying an electronic circuit is being developed for racing engines by Joseph Lucas, Ltd. Existing systems are restricted by such factors as mechanical considerations of contact breaker design to about 400 sparks/sec with coil ignition and 500 sparks/sec with magnetos. In the new system, a spark rate of 1,000/sec is possible, equivalent to an eight-cylinder engine running at 15,000 r.p.m. Spark voltage is constant over the entire speed range and timing is determined by an electromagnetic triggering device associated with the engine flywheel.

The system comprises an electromagnetic pickup associated with pole pieces attached to the engine flywheel (or on a light wheel fitted to the opposite end of the crankshaft), a trigger amplifier, a spark generator unit and a high tension distributor.

A voltage impulse is produced at the pickup by the passage of each pole piece. This pulse is applied to the trigger amplifier, which breaks a current flowing through the primary winding of a trigger transformer. A voltage is induced in the secondary winding, causing a current to flow in the base circuit of the spark generator

### REVISED Y.E.B. TARIFFS

As reported in last week's issue, the Yorkshire Electricity Board has announced that its charges are to be increased to meet rising costs. The proposed variations are as follows:

*Block Tariffs.*—The present rates of 6d, 2d, 1d and 0.8d are to be altered to 6d, 2.25d, 1.25d and 0.9d. The first domestic block will be increased by 1 kWh per room and the first blocks of other tariffs *pro rata*.

*Two-part Tariffs.*—Maximum demand charges to be raised by 5s per kVA or kW per annum or 6d per month and the "unit" charges by: first block 0.065d; second block 0.055d; and third block 0.035d.

*Restricted Hour Tariffs.*—Tariff O.P.1: no change. Tariff O.P.2: "unit" charges to be increased by 0.035d.

### Advertisement Correction

In the advertisement of Herman Smith Smithlite, Ltd., on page 20 of this issue the price of the "Swallow" fire with log effect is given as £15 7s 6d with £2 18s 3d tax; the latter figure should be £2 16s 3d.

unit. An associated transistor becomes conducting, so that current flows in the primary winding of a high voltage transformer. A regenerative oscillation is initiated which induces over 20 kV in the secondary, which is fed to a rotor arm and distributed in the normal way. Regeneration ceases when the transformer is saturated, and the transistor again becomes non-conducting. The complete cycle time for regeneration is less than 200  $\mu$ sec. With the cessation of the voltage pulse at the pickup, conduction again commences in the trigger amplifier circuit in readiness for the cycle to be repeated.

The running current is proportional to speed, rising from about 0.25 A at 50 sparks/sec to 2.5 A at 500 sparks/sec. This system is being developed for high performance engines, and for normal engine applications present equipment will continue to be used.

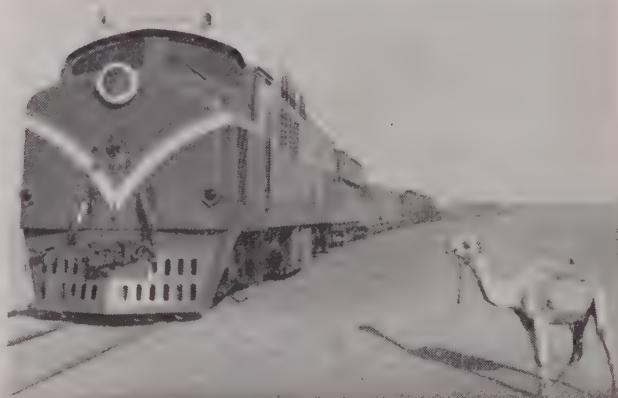
### Volta River Project

The Government of Ghana has signed a \$10.6 million contract with Kaiser Engineers & Constructors, Inc., Oakland, California, for the detailed engineering design of the Volta River hydro-electric project, obtaining major equipment and inspecting construction. Tenders for a dam and power plant at Akosombo were publicly opened on 16th February and submitted to Kaiser Engineers for evaluation and review in their supervisory capacity. The Akosombo section, which is estimated to cost \$168 million, will be the first of four stages in the overall hydro-electric development of the Volta River during a 12-year period. The ultimate installed power capacity of the scheme will be 896 MW.

A consortium of American aluminium producers headed by the Kaiser Aluminum & Chemical Corporation has established the Volta Aluminium Co. (Valco) with the object of building an aluminium reduction plant in the Tema Harbour area.

## Diesel-electric Locomotives for the Sudan

This diesel-electric locomotive seen hauling a heavy freight train on its way to Port Sudan is one of fifteen recently supplied to the Sudan Railways by the English Electric Co., Ltd.



## Housecraft Examination Awards

THE Electrical Association for Women has awarded the following trophies for success in its 1960 housecraft examinations:

*Councillor Miss Walter* rosebowl: Dame Allan's School, Newcastle-upon-Tyne. Runner-up, Pate's Grammar School for Girls, Cheltenham.

*Cheltenham Silver Jubilee* awards: First, Mrs. Margaret Hardwick (Macclesfield Branch); joint second, Mrs. Barbara Poynton (Nottingham Branch); Mrs. Mary Lees and Mrs. Christina MacGregor Whyte (both of Oban Branch); and Mrs. Rhoda Fellows (Wolverhampton Branch).

*Elizabeth Sloan Chessier* cup: Mrs. R. M. Robinson (South Eastern Elec-

tricity Board, Twickenham). Joint runners-up, Miss M. I. Ralphs (Midlands Electricity Board, Kidderminster) and Mrs. A. P. J. Coates (M.E.B., Worcester).

*Dowager Lady Swaythling* trophy: Caerphilly and Nottingham Branches (joint winners).

### ANGLESEY NUCLEAR PROJECT

The Minister of Power has decided that a public local inquiry shall be held into the proposal of the Central Electricity Generating Board to build a nuclear power station at Wylfa in Anglesey.

INDUSTRIAL NEWS *[continued]***M.E.B. CHANGE-OVER COMPLETED**

FOLLOWING the completion of a £152,000 programme for the standardisation of the electricity distribution system in Leek, Staffs., the chairman of the Midlands Electricity Board, Mr. W. S. Lewis, C.B.E., J.P., Companion I.E.E., last week switched off the d.c. supply that had been in use in the town for nearly 60 years.

The ceremony, which took place at the Board's premises in Station Road, Leek, also marked the end of d.c. supplies throughout the M.E.B.'s area of 5,000 square miles; for nearly two years the only remaining d.c. consumer had been the Leek silk manufacturing

plant of Brough, Nicholson & Hall, Ltd.

Mr. Lewis said that when the Board was established in 1948 there were 74,000 d.c. consumers and several million pounds had been devoted to the change-over work.

**Cook Strait Cable Approved**

The New Zealand Government has approved the laying of a power cable across Cook Strait and it is expected that power will be transmitted to the North Island grid from the South Island by 1965. The estimated cost of the scheme is nearly £19 million sterling and tenders will be invited within a few weeks.

**Electric Motor Manufacture in Israel**

AT the invitation of several leading Israeli engineering companies, Mr. A. J. Newman, chairman and managing director of Newman Industries, Ltd., is visiting the country to discuss plans

for building a new factory at Tel Aviv to manufacture Newman electric motors under licence. Newman Industries will also supply the necessary machinery, drawings and technical information for the establishment of the factory. Initially, only a limited range of motors would be made; others would be supplied from the Yate factory, which would also manufacture certain component parts for assembly in Tel Aviv.

Newman Industries have already signed an agreement to set up a similar factory in Pakistan.

**Monopolies Report**

THE report by the Board of Trade on the operation of the Monopolies and Restrictive Practices Acts, 1948 and 1953, for the year ended 31st December, 1960, has been published (H.M. Stationery Office, 6d). One of the references which the Monopolies Commission still had before it during the year was one on the supply of electrical equipment for mechanically-propelled land vehicles, a reference made in 1957.

A complaint was received that "the big cable firms were trying to eliminate competition from the smaller firms" and, it is said, "this matter is being kept under review." A suggestion was made during the year, *inter alia*,

that the supply of telephone equipment should be referred to the Monopolies Commission.

**Two Men Killed in Substation Explosion**

Two Yorkshire Electricity Board employees, Mr. John Thwaites (56), second assistant district engineer, and Mr. A. Clarkson (40), a charge-hand joiner, were killed in an explosion in a substation in Lawkholme Lane, Keighley, on 6th March. The inquest was opened on 8th March and adjourned for a week.

**Fluorescent Light on Paintings**

An exhibition of reproductions of celebrated paintings was opened on Tuesday at the Crown House, Aldwych, showrooms of the A.E.I. Lamp & Lighting Co., Ltd. Each painting is illuminated by "Mazda Kolor-rite" fluorescent lamps and the exhibition serves to demonstrate the natural daylight colour qualities of the lamps.

"Kolor-rite" lamps, first introduced in September last, have also been installed in the studio where the reproductions of the paintings are produced and in the Leicester Museum and Art Gallery where there is a ceiling installation comprising 57 lamps. The level of illumination of the exhibition wall is said to be 25/30 lumens/sq ft.

**ATOMIC POWER IN WEST GERMANY**

West Germany's first atomic power station, at Kahl, is expected to start production at the end of this month, it is announced. Its eventual capacity will be 15 MW.

**Prices of Materials**

In the accompanying table we give the basis prices of the more important materials used in the electrical

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £223 15s 0d
Fire Refined 99.70%	ton £222 0s 0d
Fire Refined 99.50%	ton £221 0s 0d
COPPER Tubes ..	lb 2s 2½d
Sheet ..	ton £259 5s 0d
H.C. wire and strip ..	ton £276 5s 0d
LEAD, English ..	ton £65 15s 0d
Foreign ..	ton £64 0s 0d
MERCURY ..	flask £69 0s 0d
TIN, block (English) ..	ton £813 0s 0d
ZINC, G.O.B. Foreign	ton £86 5s 0d
BRASS Tubes (solid drawn) ..	lb 1s 10d
Wire ..	lb 2s 8½d
PHOSPHOR BRONZE	lb 4s 1d
Wire ..	oz £30 5s 0d
PLATINUM ..	lb 26½d—26½d
RUBBER, No. 1 R.S.S.	
spot .. ..	

industry. The figures given are the selling prices and are those quoted on Tuesday last.

**LARGE CABLE CONTRACT**

A contract valued at approximately £1.5 million has been received from the Central Electricity Generating Board by W. T. Glover & Co., Ltd., for the supply and installation of 132 kV cables in the London area. It involves 145,000 yards of 0.75 sq in pre-impregnated, paper insulated, single-core, gas-filled cable designed to transmit a load of 150 MVA, with the associated control and communication cables. The route length is approximately 13½ miles and necessitates the under-passing of the River Roding. The first stage of laying the cable, from Barking to Brunswick Wharf, is required to be completed by November and the West Ham section next year.

**Birmingham Wholesalers' New Premises**

The new headquarters premises of Rich & Pattinson (B'ham), Ltd., at Essex House, Kent Street, Birmingham, 5, were recently officially opened by the Lord Mayor of Birmingham, Ald. Garnet B. Boughton, who unveiled a plaque commemorating the occasion. The modern office, showroom and warehouse building is generally of two-storey construction with a single-storey wing. The Kent Street frontage has two large display windows and a loading bay.

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<b>944</b> TRAXCAVATOR	105	2 cu yd	0-24.1	0-30.0
<b>966</b> TRAXCAVATOR	140	2½ cu yd	0-22.8	0-28.6

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of Tudor Griffiths  
shows 944 Traxcavator  
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# 1961

INDUSTRIAL NEWS *[continued]*

## Old Property Rejuvenated by Electricity

A PRIVATE firm of builders in Fulham, London, J. W. Marston & Son, has purchased a row of 12 terraced houses built about 75 years ago, and lacking a bathroom, a hot water supply, and a modern kitchen. By imaginatively replanning the interiors and building small extensions in the yard at the back, space is being found in each house for two self-contained all-electric flats with two bedrooms, living-room, kitchen, bathroom and w.c. as well as a hot water supply. Two of the completed houses as well as the remainder in their original dilapidated condition were recently open to the public to draw attention to the availability of "standard grants" towards the cost of such work, and as examples of how older properties can be improved and their lives greatly extended thereby.

All fireplaces have been bricked up and provision made for using electric fires connected to a ring circuit. In some flats, a hot water cylinder, with immersion heater, has been installed in an airing cupboard on the landing or in a cupboard below the kitchen working surface. In the upper flats, space has been found for a complete bathroom, with overhead infra-red heater, in the attic, a larger window being provided. The original living-rooms and sculleries have been "open-planned" and provided with a Belling auto cooker, a sink unit with ventilated food store underneath, a Hoovermatic washing machine, a Prestcold refrigerator, and a Magicoal electric fire.

The dwellings demonstrate what can be done in the way of restoring and

modernising old but sound property by installing modern amenities, particularly electricity. The scheme providing for the payment of standard grants to assist property owners in carrying out such work, including discretionary grants covering more extensive modernisation, deserves to be more widely known. A six-page leaflet entitled "No bath or hot water

system? Here's big news: Free grants for modernising old houses," giving full details of the scheme, has been



*Re-designed living-room and kitchen in a 75-year-old terrace house*

published by the Electrical Development Association, 2, Savoy Hill, London, W.C.2.

## Air-Blast Switchgear for Supergrid

ORDERS worth about £700,000 have been received by the English Electric Co., Ltd., from the Central Electricity Generating Board for equipment for supergrid switching stations at Sundon, Bedfordshire, and Feckenham, Worcestershire. The two 275 kV switching stations will be equipped with ten of the latest air-blast circuit-breakers, rated at 15,000 MVA 2,000 A. One of these units is also being manufactured for the Connah's Quay switching station, Flintshire. This

breaker, designated rT6C, is the first of a new range which will cover voltages from 132 kV up to 550 kV or higher. They are fully pressurised throughout in both the open and closed positions and do not incorporate a make switch. This, coupled with the fact that the breakers are mechanically operated up to the last stage, ensures high performance, the breakers being guaranteed re-strike free and at all voltages have a total break time of  $2\frac{1}{2}$  cycles maximum.

The various voltage ranges are covered by using multiples of the same interruptor, which can be supplied for current ratings up to 4,000 A, those on order incorporating six. The interruptors are shunted by linear switching resistors and also by capacitors for ensuring voltage division when the breaker is in the open position.

## Fostering Trade with the Middle East

THE Middle East Association has been registered as a company limited by guarantee without share capital. Its objects are to promote and encourage closer trade relationships between representatives of and visitors from Middle East countries and United Kingdom companies and others with a view to promoting a closer relationship for the benefit of mutual trade, etc. The management is vested in an Executive Committee, the first members of which are:—J. E. Allcard, A. E. Durling, F. W. Edwards, H. S. Feetham, Sir Neville A. Gass, M. Kewley, L. H. Short and R. M. Wynne-Edwards.

The members of the Association

include Associated Electrical Industries, Ltd., Balfour, Beatty & Co., Ltd., British Insulated Callender's Cables, Ltd., Constructors John Brown, Ltd., the English Electric Co., Ltd., Ewbank & Partners, Ltd., Ferranti, Ltd., the General Electric Co., Ltd., and A. Reyrolle & Co., Ltd.

### Washing Machine/Spin Dryer Price Reduction

The General Electric Co., Ltd., is reducing the price of its "Double-Plus" washing machine/spin dryer from £83 9s 6d to £59 10s. The cut in price takes immediate effect.

### P.O.A. "MINIBITION"

This year's "Minibition" organised by the Purchasing Officers' Association will be held at the Hotel Metropole, Brighton, from 28th to 30th September, in conjunction with the Association's annual conference. Further details can be obtained from the secretary of the Association at Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4.

INDUSTRIAL NEWS *[continued]***SEMICONDUCTOR EXHIBITION**

**A**N exhibition was held in London last week by Mullard, Ltd., to exemplify the use of semiconductors in industrial and scientific applications, to introduce a computer-based system of life-testing and to present their complete range of industrial semiconductor devices. Nearly 150 exhibits, the products of 100 electronics firms, were shown, every item using semiconductor devices. Categories included industrial control systems; computers; medical electronics; r.f. and a.f. communication equipment; test gear; measuring instruments; and a wide range of sub-units such as power supplies, amplifiers, convertors and regulators.

A statistical life testing system in operation at the Southampton works

involves punched cards, automatic data recording and processing by computer. Some aspects of this were shown in a new series of 10-minute filmstrip lectures. The subjects covered were

published data and the transistor; a new high power d.c. convertor circuit; semiconductor quality control; details of Mullard life testing; semiconductor reliability and testing; and transistor environmental and vibration life testing. The series will be extended to cover other subjects, and it is hoped to make the entire range available on free loan to interested organisations.

**TRADE ANNOUNCEMENTS**

The Ipswich branch of **British Insulated Callender's Cables, Ltd.**, has been moved to new and larger premises at 1, Benezet Street (telephone: Ipswich 57265).

The North West and North East sales regions of the **A.E.I. Lamp & Lighting Co., Ltd.**, are now combined in one sales territory known as the Northern region. The manager is Mr.

G. W. Nattrass, whose office will remain at 46, Wellington Street, Leeds (telephone 31541), the headquarters of the new region.

**Electrolux, Ltd.**, has appointed the following new area managers: Messrs. R. H. B. Brownword (Western); T. A. Johnson (Southern); A. E. Shields (North East); C. E. Smith (South East); J. Taylor (North West); J. J. Thomson (Western); K. Thorne (South Wales); J. S. White (London); and J. B. Wilson (Southern).

**Aircraft-Marine Products (Great Britain), Ltd.**, have appointed Mr. J. H. Munns area sales engineer for South West England covering Gloucestershire (parts), Wiltshire, Hampshire, Somerset, Dorset, Devon and Cornwall.

**The Modern Equipment Co., Ltd.**, has appointed Mr. F. T. Olney, 38, Beer Street, Yeovil, Somerset, as its area sales manager for the southern half of the country and Mr. T. Glossop, 12, Church Road, Moorgreen, Newthorpe, Notts., as area sales manager for the north.

**N.S.F., Ltd.**, state that under an agreement recently concluded with W. Holzer & Co., Meersburg, West Germany, they have been appointed licensees in the United Kingdom for the manufacture and sale of the Holzer range of clockwork and motor-driven time switches.

**U.S. Control Company's British Subsidiary**

The Controls Company of America has formed a British subsidiary, the Controls Company of America (U.K.), Ltd., which will be under the direction of the American organisation's Canadian subsidiary. Mr. D. A. O'Leary, chairman, said recently that assembly operations had already begun at a factory at Woking which would become the headquarters of a planned expansion leading eventually to a chain of factories throughout Britain. A few weeks ago a subsidiary was established in France and a European administrative headquarters in Zug, Switzerland.

**Cable Works Visit**

Inside the main factory of Telephone Cables, Ltd. Left to right: Mr. A. F. Lampitt, managing director, Telephone Cables, Ltd.; Lord Chandos; Mr. W. A. MacKenzie, works manager of the factory; Mr. A. T. C. Moore, director and chief engineer; and Dr. J. N. Aldington, managing director, Associated Electrical Industries (Woolwich), Ltd.

LAST week Lord Chandos, chairman of Associated Electrical Industries, Ltd., paid his first visit to the Dagenham factory of Telephone Cables, Ltd., since the company's name was changed from Southern United Telephone Cables, Ltd. The company is now owned by A.E.I. and Enfield Cables, Ltd.

Lord Chandos made a comprehensive tour of the factory, the largest of its kind in Great Britain, which has a floor space of 250,000 sq ft. He was shown the processes in operation of making polythene coaxial and tele-

phone cables of all types for use by the G.P.O. and telephone companies in other countries.

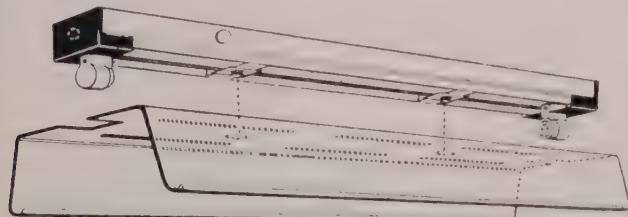
**M.I.P. SALES CONFERENCE**

During the annual sales conference of Measuring Instruments (Pullin), Ltd., representatives and agents spent a day at the Pullin Group headquarters. Mr. C. H. Copley, manager of R. B. Pullin's process control division, gave an address on the new process control equipment and discussion groups were formed.

# IMPROVED ATLAS FLUORESCENT FITTINGS



A NEW and improved version of the "Atlantic" series of fluorescent fittings has recently been announced by ATLAS LIGHTING, LTD., Thorn House, Upper St. Martin's Lane, London, W.C.2. The new fittings, known as the "Atlantic 2" range, are based on the principle of a common chassis with different attachments but incorporate several new design features. The basic spine is available in 4, 5 and 8ft sizes in single- or twin-lamp versions. The spring-loaded bi-pin lampholders, of new design, slide easily into position in the cast end plates of the fittings and no fixing screws are required. Keyhole slots on the reflector plate and reflector attachment facilitate positive fixing by means of sliding retainer screws on the chassis and the diffuser attachments. The starter switch replacement is through the side



Basic "Atlantic 2" spine with reflector attachment

of the fitting, which further simplifies maintenance.

All metal parts have a "Miracryl" enamelled finish, which is claimed to offer a high resistance to abrasion (during cleaning and maintenance) and chemical attack. Four types of diffuser are offered for use with the fittings. These comprise the AAB series, opal "Diakon" with a bold reeded pattern for general commercial lighting applications; the clip-in plastic moulded end plates are available in white or blue. The AAC series, also opal "Diakon" diffusers, have a plain exterior surface and opal "Perspex" end plates, rebated and cemented flush with the ends. These are suitable for such installations as shops, banking halls, etc. The AAD series are attractive open base units with side panels extruded from stabilised opal polystyrene with moulded end caps. Spring clips engage round the tube in the single lamp version of the AAE series, while in the twin-lamp version the

diffuser is fitted to the cover plate. Blue moulded clip-in end caps provide a contrast in tone with the fine reeded opal extrusion.

There are, in addition, five reflectors, the AAL series for lighting wall charts and shop window use; the AAO series, a translucent reflector which provides a high degree of diffused upward lighting; the AAW series, trough reflectors with closed ends and top; the AAY series, open end reflectors which are readily adaptable to continuous mounting; and the AAZ series, open end reflectors with flared slots to give upward lighting.

The prices of the "Atlantic 2" fluorescent fittings range are substantially below those of the "Atlantic 1" range which they now supersede, in some cases by as much as 25 per cent. Typical price comparisons are: Single 80 W batten with starter switch, £5 14s (old price £6 12s); twin 125 W batten with quick start, £15 14s (£19 4s); twin 80 W diffused fitting with starter switch, £15 1s plus £1 1s 5d purchase tax (£20 2s 6d plus £1 1s 5d 11d tax).

## Fluorescent Lighting Development

A fluorescent lighting system using fittings incorporating two 8ft tubes rated at 85 W each has been announced by Atlas Lighting, LTD., and Ekco-Ensign Electric, LTD. The

new tubes have an initial efficiency of 81 lumens/W (White colour) or 48 (Natural colour), an average efficiency through 5,000 hours of 74 or 41 lumens/W, and the total average light output is 12,600 and 7,000 lumens respectively for the twin tube circuit. The surface brightness is 5.4 candelas per sq in. A feature of the new "Super-8" circuit is a single 17in long control gear housed in the spine of the fitting and with connections made direct to the 230/240 V supply and to the four lampholders. The total control gear power loss for two tubes is 35 W and the overall power factor is 0.95 lagging, giving a loading of 216 VA per fitting.

The lower loading of the new tube of 10½ W/ft results in cooler running and its efficiency being less affected by higher ambient temperatures. Efficiencies for various twin tube fittings expressed as the percentage of lumens emitted compared with those from a tube in free air at 25°C are:—Open batten 87 per cent; metal reflector 77 per cent; and enclosed diffuser 68 per cent. The twin tube circuit and the 8ft tubes will be marketed in June as part of the "Atlantic 2" range of fittings. List price for the basic "Super-8" batten fitting is £11 10s 6d.

## ENGINEERS' GUILD

The 5,000th member of the Engineers' Guild, LTD., was elected recently and, says the Guild, the membership is increasing steadily. Over the last 16 months membership has risen by 10 per cent, which indicates an average increase of 375 members per annum. The Guild was founded in 1938.

## NEW ELECTRICAL EQUIPMENT

### MICROMINIATURE LAMP

A microminiature incandescent lamp measuring only 0.055in diameter and 0.175in long is to be marketed by the Special Products Division of THORN ELECTRICAL INDUSTRIES, LTD., Great Cambridge Road, Enfield, Middx. Known as the "Mite-T-Lite," it contains a filament made from 0.00025in diameter tungsten wire wound in a coil of 40 turns, and is designed to operate between 1.0 and 1.5 V with an optimum value of 1.3 V. The cold resistance is 6.5  $\Omega$  minimum and hot resistance 38.0  $\Omega$  minimum, at a current of 35 mA. The lamp current is only 30 mA maximum at 1.3 V d.c. which permits direct operation from a transistor. Operating at this voltage the life expectancy is approximately 2,000 hours. The light output is 45-50 millilumens at 1.5 V d.c. and this output will follow voltage impulses up to 100 pulses per second.

### INSULATING LACQUER

A clear acrylic lacquer developed in America which forms a transparent flexible protective coating, is now available in this country from PLASTIKOTE, LTD., Silbury Street, London, N.1. In addition to offering protection against water, oil, petrol and similar substances, the coating is heat resistant, being capable of withstanding a temperature of 240°F, and it can be used as an electrical insulant except under conditions of mechanical stress, a single coating giving an insulation tester reading in excess of 20 M $\Omega$ . It is supplied in the form of an aerosol spray in approximately 1 pt capacity cans—price 16s. The cans are pressurised with freon gas to 40 p.s.i. at room temperature. The company also markets a wide range of aerosol spray paints, enamels, lacquers and stains, some of which are available with a hammer finish.

### AUTOMATIC FLEXIBLE CABLE WINDER

The "Metool" flex winder produced by METROPOLITAN TOOL & PRODUCTS, LTD., 21, Victoria Street, Nottingham, is designed to handle light flexible cables supplying portable equipment. Up to 25ft of 4-core 40/0.0076in flexible may be accommodated on this unit or alternatively 30ft of 3-core 23/0.0076.

The flexible passes unbroken from the supply to the point of attachment to the unit being fed and since there are no sliprings or brushgear this type of unit could readily be used on telephone, thermocouple, strain gauge, or similar circuits, where the resistance or impedance of the cable must remain constant for successful operation. The flexible is laid in a stationary unit by a pulley fitted to a spring loaded rotating arm.

### MOULDED CABLE JUNCTION

An integrally moulded cable junction with one inlet cable and either two or three outlet cables, providing mobile weather- and dust-proof socket outlets on industrial sites and installations, is now being manufactured by NETTLE ACCESSORIES, LTD., Warren Street, Stockport, Cheshire. The inlet cable can be terminated in any plug suitable for the user's supply outlet, and the

outlet cables by weatherproof connectors.

The junctions can be supplied in either rubber or neoprene and the junction between the cables is moulded inside a block of rubber or neoprene with adequate cable clamping to ensure good mechanical strength. Both the inlet and outlet cable lengths can be varied to suit individual conditions and they are available in either 3-core 40/0.0076 or 3-core 70/0.0076 cable. The trade price of the junction is 12s 8d, to which must be added the price of the requisite cable and the cost of the connectors if required. The cost of moulding the cable to the junction is included in this price.

### MOTOR STARTER

A 5 h.p. starter, known as the DOC.80, for three- and single-phase motors has been introduced by the Motor and Control Gear Division of A.E.I., LTD. It is claimed to be the lowest priced unit giving single-



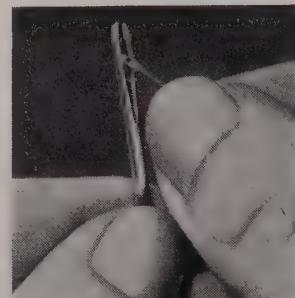
Nettle Accessories moulded cable junction



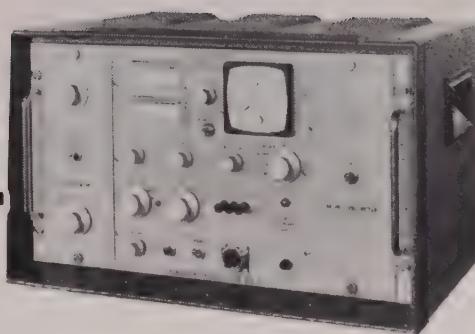
A.E.I. type DOC.80 starter with single-phasing protection



"Metool" flexible cable winder



Thorn microminiature lamp



Microcell transistor analyser

phasing protection on three-phase supplies. An ambient temperature compensator is incorporated to allow for differences in local temperature between the starter and the motor.

A set of overload heaters supplied separately can be fitted very quickly to make the starter ready for service. There are fifteen different heater ratings, which, with the calibration control, enable the relay to give precise protection of the motor. The starters are supplied fitted with any one of five coils covering standard voltages. These, together with the range of fifteen overload heaters, will give 75 possible variations of the starter.

The starter can be easily mounted into position, three-point fixing being carried out from inside the case without having to remove any component. Leads can be taken in and out of the starter from the top, bottom or side. The starters are priced at £4 12s 6d each, less overload heaters, which are 12s 6d per pack. An illustrated leaflet, No. 3681-83, is obtainable on request to Associated Electrical Industries, Ltd., Motor and Control Gear Division, Industrial Control Gear Sales, Marsden Mill, Nelson, Lancs.

#### TRANSISTOR ANALYSER

An instrument designed to measure the parameters of p-n-p and n-p-n transistors has been produced by MICROCELL, LTD., Electronics Division, Blackwater, nr. Camberley, Surrey. Parameters which can be measured are amplification factor ( $\beta$ ), cut-off frequency ( $f_{co}$ ), collector leakage current ( $I_{co}$ ) and collector turnover voltage ( $V_{to}$ ) of transistors (grounded emitter configuration) and  $V_{to}$  and  $I_{co}$  of diodes. Features are the use of a differential input wide-band valve-voltmeter as a  $\beta$  indicator and a wide-band oscillator as a signal source. The response of the valve-voltmeter is within  $\pm 1.5$  dB from 1 kc/s to 10 Mc/s. The oscillator, which is a Wein bridge type, covers the range 1 kc/s-10 Mc/s and is amplitude stabilised to within  $\pm 1.5$  dB.

Collector, oscillator and valve-voltmeter supplies are fully stabilised.

Collector voltage and collector current are monitored on edge-type meters and all the meters are fully protected against overload. Base current may be measured by plugging in an external meter. Provision is made for external adaptors to be used in order to measure transistor "h" parameters, etc.

The collector supplies are 0-100 V 30 mA, 0-10 V 3 A and the collector current meter has a full-scale deflection of 30  $\mu$ A-3 A in six ranges. The turnover voltage ( $V_{to}$ ) is 0-100 V with the current internally limited to 5 mA. The power requirement is 200 VA at 100/220  $\pm 20$  V 50/60 c/s.

#### DIGITAL VOLTMETER

In the digital voltmeter type LM902.2 announced by SOLARTRON LABORATORY INSTRUMENTS, LTD., Cox Lane, Chessington, Surrey, d.c. voltages from 100  $\mu$ V to 1,599 V are presented as a four-digit display in decimal form with polarity discrimination. Display is by optical projection and red and black backgrounds signify positive and negative inputs respectively.

Voltage measurements are covered in five ranges. The input impedance is 10 M $\Omega$ , except in the two lower ranges, which have impedances of 1 M $\Omega$  and 100 k $\Omega$ . The long-term accuracy is  $\pm 0.1$  per cent of maximum reading on each range. Two additional voltage ranges of 100 V to 1 kV have input impedances of 100 M $\Omega$  and a measuring accuracy of  $\pm 0.5$  per cent. The read-out time is constant at 280 msec irrespective of the voltage input, which may be "floated" up to 700 V with respect to earth. The

internal zener reference can be preset and corrected if necessary against the built-in Weston standard cell.

Under "auto" operation voltages are measured continuously, any variations causing the instrument to display a new reading. An adjustable "dead zone" can (within limits) make the instrument insensitive to small changes in voltage. When switched to the "sample" mode of operation a single voltage reading is taken, either by manual operation of a panel button or by remote electrical command, and retained on display until a succeeding sample is taken. Two 50-way sockets provide decimal coded digital information, polarity and print command signals suitable for feeding into a Venner TSA 65 printer and an additional display unit.

#### ANGLE ENCODING SYSTEM

An angle encoding system developed by the Norden Division of the United Aircraft Corporation is now available in the United Kingdom through KETAY, LTD., Eddes House, Eastern Avenue West, Romford, Essex. Known as BEL-5, it divides a single shaft revolution into 360,000 parts and simultaneously provides parallel real-time readouts in three forms: electrical 8-4-2-1 binary coded decimal, electrical straight decimal, and visual decimal on neon number tubes. Other systems also available from Ketay provide pure binary resolutions of from  $2^{18}$  to  $2^{21}$  in a single turn. The total weight of the system—which is suitable for airborne use since it fulfils the requirements of MIL-E-5400—is only 140 lb, its power requirement being 650 W.



Solartron digital voltmeter



Ketay angle encoding system

## Financial Section

# STOCKS and SHARES

FIGURES in the preliminary statement on the results of Associated Electrical Industries for 1960 satisfied market expectations. They helped to sustain the emphatic improvement in the shares of the big electrical groups which has been a feature of the industrial markets since the publication of English Electric's annual report, the news of G.E.C.'s offer for Radio & Allied Holdings and the German currency revaluation. A.E.I. shares themselves were marked up during the week by a further 2s to 48s 3d, against 42s 3d a fortnight earlier. English Electric retained most of the previous week's 7s advance, at 40s 3d, while G.E.C. went further ahead to 38s 9d, representing a gain of some 7s 6d in two weeks. Yields on the three shares, although still above the average for leading industrials, have contracted to about 6½ per cent on A.E.I. and a fraction either side of 5 per cent on English Electric and G.E.C.

### A.E.I. Results

Experiences of A.E.I. last year appear from the preliminary statement to have been on the same lines as those of 1959. Turnover increased by £7 million to £215 million, but the net group profit (before tax) fell by about 9 per cent, and after a reduced tax provision the net surplus came out only just below the previous level at £4·7 million. This again covers, with a little to spare, a total dividend of 15 per cent. Comparison of the figures for the whole period with those published for the first half of it suggests that they were influenced in the last six months by the effects of the hire-purchase restrictions on the domestic appliance business. For details of the extent to which the various branches of the group contributed to the results, however, Lord Chandos' review in the full report is awaited.

### Higher Prices

Industrial markets as a whole were again active and strong during the week, and with encouragement from the performance of the leaders in their section many electrical shares recorded further useful gains. Crompton Parkinson remained firmly on the upgrade, reaching 14s, while C. A. Parsons at

53s 9d and A. Reyrolle at 45s were both more than a shilling to the good. Domestic equipment issues were at least firmer than of late, and there were more good recoveries in "radio" shares. Support for Allen West up to 14s 6d, and Ether Langham Thompson

son up to 35s 6d attracted attention, and Cambridge Instruments went higher again to 36s 3d after the publication of the full report. Material improvements were marked in Combined Electrical Manufacturers, Eleco, Goblin, Enfield Rolling Mills, Newman

### Price Changes in

Company or Board	Nom. Value	Middle price 13th Mar.	Rise or Fall	Week's Dividend		Yield %	1961	
				Previous	Last		High-est	Low-est
<i>Gilt-edged Stocks</i>								
Brit. Elec. 1968/73	... 100	74½		3	3	4 0 6	74½	73½
Brit. Elec. 1974/77	... 100	70		3	3	4 5 9	70½	69½
Brit. Elec. 1976/79	... 100	73½		3½	3½	4 15 3	73½	71½
Brit. Elec. 1974/79	... 100	80½		4½	4½	5 5 6	82	80½
Brit. Elec. 1967/69	... 100	91		4½	4½	4 19 0	91½	89½
<i>Overseas Electric Supply</i>								
Calcutta Elec. ...	... £1	21/-		7†	7½†	11 14 0	21/6	20/6
East African Power	... £1	15/-		8	10	13 6 9	15/-	13/3
Nigerian Elec. ...	... £1	18/-		8	10	11 2 6	19/9	15/6
Perak Hydro-Elec.	... £1	19/-	+3d	10	10	10 10 6	19/-	17/6
<i>Electrical Shares</i>								
Aberdare Holdings	... 5/-	15/3		17½	17½	5 14 9	15/6	14/3
Aerialite ...	... 1/-	7/6	+3d	54	54	7 4 3	7/6	6/9
Allen, W. H. ...	... £1	38/-	-9d	14	10*‡	5 5 3	39/-	36/-
Allied Insulators ...	... 5/-	9/3		20	10*	5 8 0	9/6	8/9
Alwyn Holdings ...	... 5/-	25/9		—	12½	2 8 6	27/-	24/6
Anglo-Portuguese Tel. ...	£1	22/-	+1/-	9	9	8 3 9	25/-	20/9
Arcolectric ...	... 1/-	4/9	+6d	15	15	3 3 3	4/9	3/9
Aron Meters ...	... £1	68/-		15	15	4 8 3	68/-	67/6
Assoc. Elec. Ind. Ord. ...	... £1	48/3	+2/-	15	15	6 4 3	48/3	39/6
Automatic Tel. & El. ...	... 5/-	16/9		17	17	5 1 6	17/-	14/9
Babcock & Wilcox ...	... £1	33/9		13	9	5 6 9	33/9	30/3
Bakelite ...	... 10/-	52/-	-1/9	17½	17½*	3 7 3	56/3	42/-
Baldwin, H. J. ...	... 2/-	1/6		20	—	—	1/6	1/6
Berry's Electric ...	... 5/-	46/3	+1/3	30	30*‡	3 4 9	46/3	37/-
Bowthorpe Holdings ...	... 2/-	8/6		27	18½*	4 7 0	8/6	8/-
Brit. Elec. Resistance ...	... 2/-	7/6	+9d	17½	17½*‡	4 13 3	7/6	6/6
Brit. Elec. Traction: -								
Def. Ord. "A"	... 5/-	50/3	-9d	35	40	3 19 0	51/-	41/9
Brit. Electronic Ind.	... 5/-	13/9	+3d	—	15‡	5 11 0	—	—
B.I. Callender's ...	... £1	57/6		13½	13½	4 13 9	57/6	49/6
B.I. Callender's 6% Pref.	... £1	17/6		6	6	6 17 3	18/3	17/6
British Thermostat ...	... 5/-	38/9		35	20*	2 11 6	40/-	28/-
Brook Motors ...	... 10/-	49/6	+6d	25	25*	5 1 0	49/6	47/-
Bulgin, A. F. ...	... 1/-	10/-	+9d	50	55	3 13 3*	10/-	7/9
Bulpitts ...	... 5/-	18/-		15	16½	4 10 3	18/-	16/9
Burco Dean ...	... 5/-	9/3		18	15	8 2 3	10/-	8/9
Cable & Wireless ...	... 5/-	20/6	+1/-	10	10*	—	20/6	15/6
Cambridge Instruments ...	... 5/-	36/3	+1/3	12½†	22	3 0 9	36/3	30/-
Chloride El. Storage "A"	... £1	85/-	-1/3	20	17½*	4 2 3	86/3	72/-
Clarke Chapman ...	... £1	45/-		13½	13½	6 2 3	46/-	43/6
Combined Elec. Mfrs. ...	... 4/-	8/6	+9d	—	12½‡	5 17 9	8/6	7/6
Contactactor Switchgear ...	... 5/-	15/6	+6d	14	14	4 10 3	16/-	14/6
Cossor, A. C. ...	... 5/-	7/3		5	Nil	—	8/-	6/6
Crabtree ...	... 10/-	30/9		20	12½*	4 1 3	33/9	26/3
Crompton Parkinson ...	... 5/-	14/-	+6d	14	12½*	4 9 3	14/-	11/3
Davis & Timmins ...	... 5/-	35/3	+6d	20*	30‡	4 5 0	35/3	30/3
De La Rue ...	... 10/-	63/-	-9d	22½	22½‡	3 11 6	64/6	55/-
Decca "A"	... 10/-	62/-	+1/6	20	23½	3 15 0	62/-	52/3
Desoutter ...	... 5/-	53/-	+1/9	30	35	3 6 0	53/-	49/-
Dewhurst ...	... 2/-	9/9		20	20	4 2 0	9/9	7/6
Dictograph Tel. ...	... 2/-	12/-	+3d	20	20*	3 6 9	12/-	8/6
Dimplex ...	... 5/-	67/6	+2/6	—	30	1 17 0*	67/6	47/9
Dubilier Condenser ...	... 1/-	2/9		25	30	5 9 0*	2/9	2/3
Duport ...	... 5/-	15/-		17½	20	4 8 9*	15/-	12/6
E.M.I. ...	... 10/-	46/-	-1/3	20	17½*	3 16 0	47/3	41/6
Eleco ...	... 2/-	7/-	+6d	20	20	2 17 3*	7/-	4/3
Electrical Apparatus ...	... 5/-	17/3	-3d	14½	20	5 16 0	17/9	17/-
Electrical Components ...	... 5/-	9/6		15	11½*	6 1 0	9/6	9/-
Elec. Construction ...	... £1	33/6		9	9	5 7 6	38/3	30/6
Elliott-Automation ...	... 5/-	28/9	-3d	9·3	12‡	2 1 9	29/-	25/6
Enfield Rolling Mills ...	... £1	48/-	+1/9	15	15	6 5 0	48/6	46/3

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

\* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Industries, Arcolectric and a number of others.

### Dividends Declared

Ericsson Telephones and A. H. Hunt (Capacitors) are both paying dividends for 1960 at the same rate as before,

but on capital increased by "rights" issues. Ericssons report a substantial improvement in the trading profit to above the million mark, and a very satisfactory volume of orders on hand. Profits of A. H. Hunt are somewhat below those of 1959, but still cover

with an ample margin the dividend of 20 per cent. Prices of both shares had been rising steadily in anticipation of the results. After the announcement, A. H. Hunt shares were a little reactionary at 23s 9d, while Ericsson were advanced further to 27s 6d.

## Electrical Investments

Company or Board	Nom. Value	Middle price 13th Mar.	Week's Rise or Fall	Dividend			1961	
				Pre- vious	Last	Yield %	High- est	Low- est
<i>Electrical Shares—continued</i>								
English Electric ...	£1	40/3	6d	10	10	4 19 6	40/9	32/-
English Electric 3½% Pref. ...	£1	11/-		3½	3½	6 16 6	11/9	11/-
Ericsson Tel. ...	5/-	27/6	+9d	13†	13†	3 17 0	27/6	23/3
Ever Ready ...	5/-	34/6	-3d	27½	20*	2 18 0	34/9	31/6
Falk Stadelmann ...	£1	24/-		10	7½	6 5 0	24/6	21/9
G.E.C. ...	£1	38/9	+1/9	10	10	5 3 3	40/-	29/3
G.E.C. 6½% Pref. ...	£1	18/3	+3d	6½	6½	7 2 6	19/3	18/3
General Cables ...	5/-	6/3	+1/9	15	Nil	—	6/3	3/9
Goblin (B.V.C.) ...	5/-	8/3	+2/3	12½	10	6 1 3	8/6	6/-
Hackbridge Holdings ...	5/-	6/9	+9d	20	20	7 8 3*	6/9	5/-
Harland Engineering ...	5/-	18/-	6d	14	16*	4 9 0	18/6	15 6
Head Wrightson ...	5/-	23/9		20	14*	2 19 0	23/9	22/-
Heatrae ...	2/-	13/3	-6d	20	22½	3 8 0	14/-	13/-
Holophane ...	5/-	18/9		26	30	8 0 0	18/9	17/3
Hoover ...	5/-	50/-		90	45*	4 10 0	50/-	46/-
Hunt, A. H. ...	4/-	23/9	-1/-	20	20	3 7 3	25/9	18/-
Intl. Combustion ...	5/-	30/6		30	30	4 18 3	30 6	24 -
Intl. Computers & T. ...	£1	85/-	-1/3	10	11½	2 13 0	86/3	59/-
Johnson & Phillips ...	£1	22/9		5	Nil	—	22/9	17/6
Kenwood Mfg. ...	1/-	5/6		—	—	—	6/-	5/3
Laurence Scott ...	5/-	17/3	-6d	15	15*	4 7 0	17/9	15/3
Lister, R. A. ...	£1	54/-		14	14	5 3 9	54/-	47/3
Lucas, J. ...	£1	64/6		12½	13½	4 5 3	65/-	62/-
Marryat & Scott ...	2/-	15/6	+3d	22½	27½	3 11 0	15/6	13/9
Mather & Platt ...	£1	46/9	-2/6	11	11	4 14 0	51/6	41/6
Metal Industries ...	£1	63/6	-9d	14	15	4 14 6	64/3	53/-
Midland Elec. Mfg. ...	£1	60/-	+1/3	12	12	4 0 0	60/3	58/6
Murex ...	£1	44/-	+1/3	15	20	5 4 0*	44/-	39/3
Newman Ind. ...	2/-	5/9	+3d	12½	12½	4 7 0	5/9	5/-
Oldham & Son ...	1/-	2/9	3d	17½	17½*	6 7 3	3/-	2/3
Parsons, C. A. ...	£1	53/9	+1/9	8½	9½	3 9 6	53/9	46/9
Philips' Lamps ...	£1.10	250/-	+15/-	16	16*	1 5 9	£12½	£10½
Plessey ...	10/-	53/-	+3d	15½*	17½	3 4 3	53/-	46/6
Pullin, R. B. ...	2/-	12/-		25	25	4 3 3	13/3	11/3
Pyrotexan ...	5/-	53/6	+1/-	34	40	3 14 9	53/6	46/6
Radiation ...	£1	34/6	+3d	6	12	6 19 0	35/3	31/6
Reliance-Clifton ...	5/-	25/3	+9d	15	15	2 19 6	25/3	22/6
Reyrolle ...	£1	45/-	+1/3	17½	17½	3 17 9*	45/-	36/6
Richardsons Westgarth ...	10/-	6/6		8½	8½	—	7/-	6/6
Sangamo Weston ...	10/-	28/-		12½	11*	3 18 6	28/-	26/3
Scott, James ...	5/-	25/9		24	25*	4 17 0	27/9	25/6
Simon Engineering ...	5/-	37/-	+9d	—	26·6*	3 12 0	37/-	28/-
Smith (England), S. ...	4/-	19/9	+3d	17½	20	4 1 0	19/6	17/-
Southern Areas ...	£1	17/6		Nil	5	5 14 3	17/6	14/6
Strand Elec. ...	5/-	16/6	-6d	20	14·6*	4 8 3	17/-	12/3
Sturtevant ...	5/-	15/6		15†	15†	7 19 0	18/6	13/9
Sun Elec. ...	5/-	17/3	+3d	15	18½	5 7 3	17/6	17/-
T.C.C. ...	10/-	41/-		35	22½*	5 9 9	41/-	40/-
Telephone Rentals ...	5/-	25/9	+9d	12½	15*	2 18 3	25/9	21/9
Thompson (John) ...	5/-	15/9	+6d	25	20	6 7 0	16/9	14/-
Thorn Elec. ...	5/-	57/6	+6d	20	25	2 3 6	57/6	44/6
Thornycroft ...	£1	30/-		6	6	4 0 0	34/9	25/9
Tube Investments ...	£1	80/-		—	14	3 10 0	80/3	72/6
Ultra Electric ...	5/-	20/3	+1/-	20	25	6 3 6	20/3	12/6
Walsall Conduits ...	4/-	12/3		22½	15*	4 18 0	12/3	10/9
Ward & Goldstone ...	5/-	29/-		30	35	3 0 3*	29/-	25/6
Watford ...	2/-	10/6	-3d	25	25	3 16 3*	10/9	8/9
Westinghouse ...	£1	40/6		11	11	5 8 6	42/-	36/-
West, Allen ...	5/-	14/6	+1/3	12½	12½*	4 6 3	14/6	11/6
Wilkins & Mitchell ...	5/-	13/9		17	21*	—	15/3	11/9
Wolf Electric ...	5/-	16/3	+3d	10	12½	3 17 0	16/3	14/-

### Dividends to Come

From now on the flow of dividend declarations and profits statements from companies which make up their accounts to end-December will be an increasingly important influence upon the course of share prices. For the electrical market, March is not usually a big month for company news, apart from the A.E.I. report, but C. A. Parsons should be making their announcement before the end of it, followed at a short interval by Reyrolles. News is due soon from Aberdare Holdings, but the main event in the cable section—the B.I.C.C. figures—will not be seen before April. Among the companies due to report about now are Bulpitts, Chloride Electrical, A. F. Bulgin and Watford.

### Company News

An increase in the dividend of Desoutter Brothers (Holdings) from 30 to 35 per cent gives shareholders the eighth successive rise in the return from their investment. In 1960 the profits advanced by a further 17 per cent, which provides amply for the larger distribution. Having been marked up to 53s, the 5s shares yield 3·3 per cent. Bakelite 10s shares were raised to 56s 3d before the announcement of the annual results, but subsequently reverted to 52s. The dividend is being raised in effect by about 3 points to 17½ per cent, but the 9 per cent expansion in net profits was apparently smaller than had been expected.

### E. Shipton's Acquisition

No dividend is being paid by E. Shipton and Co. (Holdings) for the period up to September, 1960, but as a mark of the confidence with which the directors regard further prospects an interim dividend of 10 per cent is being paid on account of the current year. In the annual report the trading loss in 1959–60 was said to have resulted mainly from the writing down of stocks after a re-appraisal, and with the benefits of a comprehensive re-organisation to come, a successful twelve months' trading was anticipated. At the subsequent annual meeting the chairman gave details of the acquisition of English Telephone, for which the financing arrangements were under discussion. The 2s shares have been dealt in lately at around 6s.

## REPORTS and DIVIDENDS

**A.E.I. Turnover Increased.**—On a turnover which increased by £7 million to £215 million the group net profit of Associated Electrical Industries, Ltd., fell slightly to £4,722,439 (£4,746,987 in 1959). The dividend is maintained at 3s per £1 unit with a final of 2s.

Orders received during the year totalled £223 million (£182 million in 1959) and orders on hand at the end of the year amounted to £215 million (£208 million).

Net trading income, before tax but after all charges including depreciation of £6,395,092 (£6,016,621), was £8,491,853 (£9,355,060) but tax was lower at £3,769,414 (£4,608,073).

**Bakelite, Ltd.**—Record group profits were earned in 1960 by the company, which is raising its dividend from the equivalent of 14·58 per cent to 17½ per cent, with a final of 11½ per cent. Group profits increased from £1,250,554 to £1,350,808 after depreciation of £279,584 (£292,196). After £662,800 (£590,350) for tax and debenture interest, the net profit of £644,679 compares with £613,842. The preference dividend takes £36,750 (£35,625) and the ordinary £192,938 against £160,781. Union Carbide and Pinchin, Johnson & Associates hold a substantial interest in the £1·8 million equity capital.

**Desoutter Bros. (Holdings)** is effectively raising its dividend from 30 per cent to 35 per cent with a final payment of 28½ per cent for 1960.

The group net profit of £436,928 compares with £375,030, after tax of £418,546 (£355,350). There is a profit of £418,583 attributable to the company against £381,946. The 1959 balance included a tax adjustment of £21,247.

**M.E.M. Optimistic.**—The volume of orders is running at a high level, the chairman, Mr. W. J. Barber, states in the annual report. It is considered that the full benefit of steps taken to increase the volume of business has not yet been enjoyed and the board are expecting further progress in 1961.

**H. M. Hobson, Ltd.**—At the annual meeting the chairman, Mr. T. Simpson, said, "We are continuing our activities in the atomic energy industry and have been successful in obtaining substantial production contracts. We have recently delivered the control gear for the West German reactor now being built at Jülich, making the third set to be exported.

Work on the Berkeley High Activity Laboratories is progressing, and should be completed and commissioned within a short time." He also reported that the company had received orders for the variable speed alternator drive for aircraft that they had developed.

### Ericsson Telephones, Ltd.

Improved trading conditions led to a marked increase in invoiced sales in 1960, the directors state. The group trading profit expanded sharply to £1,086,650 compared with £653,160 for 1959 when £100,000 was transferred from research and development reserve.

The directors report that the order book is "very satisfactory" and that the indications are that it will continue so throughout the year.

**Philips' Lamps Profit Up.**—Final dividends of 10 per cent are announced by N.V. Philips' Gloeilampenfabrieken and Philips' Incandescent Lamp Works Holding Company, Eindhoven, making unchanged totals of 16 per cent for 1960, on the capitals increased by one-for-twenty scrip issues. This is an effective increase of about  $\frac{1}{4}$  per cent.

Sales of the operating company and of the United States Philips Trust totalled 4,762 million fl. (against 4,182 million fl.). The trading profit increased from 740 million to 862 million fl. and the net profit is up from 351 million to 397 million fl. of which 257 million fl. will be retained in the business (against 217 million fl.).

**Thos. W. Ward, Ltd.**, are raising their interim dividend for the year to 30th June, 1961, from the equivalent of 2½ per cent to 3½ per cent.

### New Companies

**Humphreys & Glasgow (Overseas), Ltd.**—Registered 7th March. Capital £5,000. To enter into an agreement with Humphreys & Glasgow, Ltd., to carry out in India (as a principal party) services works and operations relating to constructions for Atul Products, Ltd., etc. Directors: A. C. Congreve, G. G. Farthing, G. V. C. Davies and R. Langford. Solicitors: Nicholas Williams & Co., 88/90, Chancery Lane, W.C.2.

**S.G. Electrics, Ltd.**—Registered 14th February. Capital £1,000. Manufacturers of and dealers in vacuum cleaners, sewing machines, etc. Directors: S. Green and Mrs. Marie Green. Secretary: L. A. Moore. Regd. office: Crowlands Avenue, Romford, Essex.

**S. E. State, Ltd.**—Registered 14th February. Capital £10,000. Manufacturers of, dealers in and agents for telephonic apparatus, industrial and electrical apparatus, etc. Directors: S. E. State and Iris State (secretary). Regd. office: 32, Dover Road, Walmer, Kent.

**T. & S. (Electronic Developments), Ltd.**—Registered 2nd March. Capital £100. Manufacturers, repairers and letters on hire of and dealers in electrical and mechanical

measuring, testing, controlling, physical and scientific apparatus, etc. Directors: E. Taylor, R. E. Strotton and G. Taylor. Regd. office: 30, Craven Street, Strand, W.C.2.

**Snelson's Electrical (M/cr.), Ltd.**—Registered 20th February. Capital £1,000. Electrical engineers, etc. Directors: F. Ross and Margaret Ross. Secretary: R. Murtagh. Regd. office: 86, West Park Street, Salford, S.

### Meetings of Creditors

**C. & D. Electrics (Camelford), Ltd.**—Meeting of creditors today (Friday) at the Town Hall, Wadebridge, Cornwall.

**Moxham's Electrical Engineers, Ltd.**—Meeting of creditors 18th April at the offices of Harry L. Price & Co., 47, Mosley Street, Manchester.

### Liquidations

**A. Bastin & Co. (Electrical), Ltd.**, electrical engineers, 77, Barking Road, East Ham, E.6.—Last day for receiving proofs for dividend 18th March. Liquidator, Mr. A. T. Cheek, Inveresk House, 346, Strand, W.C.2.

**G.P.C. Electronics, Ltd.**—Meeting of members 12th April at 9, Ormond Close, Boswell Street, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. B. Shaw.

**Ideal Homes Electric (Lancs.), Ltd.**, dealers in electrical apparatus and appliances, 11-13, Southampton Row, London, W.C.1.—Liquidator, Mr. G. M. Maurice, of the above address, appointed by creditors on 17th February. Particulars of claims to the liquidator by 21st March.

**New Century Electric, Ltd.** (Creditors' voluntary liquidation).—Particulars of claims to the liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, by 20th March.

**Rye Electrics, Ltd.** (Creditors' voluntary liquidation).—Particulars of claims to the liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, by 20th March.

**Wrights Midland Electrical Co., Ltd.**—Meetings of members and creditors on 5th April at 126, Colmore Row, Birmingham, 3, to receive an account of the winding-up by the liquidator, Mr. R. F. Bendall.

**Reco Electronics, Ltd.**, 48, Atlantic Chambers, 7, Brazennose Street, Manchester, 2.—Winding up order made 6th March.

**R. & B. Marland, Ltd.**, electrical engineers, 11, Peter Street, Manchester, 2.—Meetings of creditors and contributors 22nd March at 20, Byrom Street, Manchester.

### Bankruptcies

**A. Robinson**, electrician, carrying on business at 47a, Newbold Road, Chesterfield, Derbyshire.—Public examination 21st April at the Court House, Brimington Road, Chesterfield.

**H. C. Holloway**, radio and electrical engineer, lately carrying on business at 30, Station Road, Birmingham, and 2, High Street, Solihull.—Public examination 12th April at the Court House, Corporation Street, Birmingham.

**R. Marland**, 214, London Road, Hazel Grove, Stockport, Cheshire, radio and electrical dealer.—Receiving order made 1st March on a creditor's petition.

**W. D. Mackin**, carrying on business as Tyne View Electrical Sales and Service at 34, Tyne View, Lemington, and 28, Wansbeck Road, Gosforth, Northumberland, electrical retailer.—Receiving order made 6th March on debtor's petition.

**A. F. Guildford**, electrical contractor, 52, Maulden Road West, Withington, Manchester.—First and final dividend of 6s 11d in the £ payable 24th March at 20, Byrom Street, Manchester, 3.

**R. P. Dyke and G. J. Roberts**, lately carrying on business in co-partnership as Eastern Telelectrics at 54, Waterloo Road, Norwich, electrical engineers. (Separate estate of G. J. Roberts).—First and final dividend of 20s in the £ payable at Norfolk House, Exchange Street, Norwich.

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TRAFFORD PARK, MANCHESTER 17

# Ideal Home Exhibition

Electrical Appliances on View at Olympia

ONE of the largest concentrations of domestic electrical appliances at this year's *Daily Mail* Ideal Home Exhibition at Olympia is on the Electrical Development Association stand where well over 100 different items of electrical equipment, many of them new or recently introduced models, are on view. The stand is divided into cleverly defined sections, under the overall theme "Plug Into Electric Living," and visitors have the opportunity of inspecting the latest electric cookers, refrigerators, home laundry appliances, etc., as well as no fewer than seven different models of dish washers. Air conditioning for the home is also featured and of particular interest is the house warming section where eight different methods of heating by electricity may be seen.

The English Electric Co., Ltd., has three separate displays, two of which are devoted to demonstrating the "Liberator" washing machine and the "Tumble-Dry" dryer. Refrigerators and cookers are the main display items on this company's ground floor stand and here the emphasis is on the new model 2034 automatic cooker with two ovens. Another cooker creating interest is the "Creda Constellation," a luxury type automatic model also with two ovens, one of which incorporates a rotary spit. In addition to this cooker, shown on the Simplex Electric Co.'s stand, the company is featuring its "Creda" built-in kitchen units. These "separates"—matching boiling units, oven, grill and warming compartments, refrigerator, control panels, etc., are designed for flexibility and each unit may be mounted at any height and position in the kitchen to suit the user. It is expected that they will be generally available in May.

Built-in units are also shown by the Electrical Division of Radiation, Ltd. These new Jackson models comprise a built-in oven with drop-down oven door, glass viewing panel, oven light, etc., and a countersunk boiling unit fitted with four "Speedring" plates. They are obtainable in either white or cream and are expected to be on the market in the autumn. A rotisserie is the latest refinement in the Jackson "Highline" range of cookers and examples of this accessory (available mid-May) are on show. The rotisserie slides into the eye-level grill runners in place of the grill pan—the grill element providing the cooking heat. A removable glass front panel is fitted and the driving motor can be conveniently plugged into the kettle socket on the cooker control panel.

The General Electric Co., Ltd., also has a new motor-driven rotary spit designed for attaching to the eye-level grill of its "Supreme" cooker. A new version of the G.E.C. "Treasure" cooker with four 7in radiant boiling plates is now available. This cooker incorporates a family-size eye-level grill, large oven with inner glass door and oven light, and a separately heated warming drawer. Each of the four hotplates has a loading of 2,100 W; they are recessed in the hob so that effective boiling facilities are provided for a number of saucepans. The latest G.E.C. refrigerators are a 2.6 cu ft absorption model and a 4.3 cu ft

compressor type. Frozen foods may be stored in the smaller refrigerator as it has a fully enclosed ice-making compartment with a capacity of 168 cu in. A full-width freezer compartment is provided in the 4.3 cu ft model, in which can be stored 17½ lb of frozen food. An unusual feature of this refrigerator is that the door, which opens within its own width, operates an internal light switch which can be seen to switch off before the door closes. It has a table top of heat resisting "Decor-Plast," finished in either red or blue. The exterior finish of both the new models is in white or honeysuckle.

On a second stand, the G.E.C. is featuring its "Double-Plus" combined washing machine and spin dryer and here, it was noted, the company is showing to the public for the first time a de-luxe version of its hot air firelighter, which is claimed to ignite coal in an open fire in 1½ to 4 minutes.

Tricity Cookers, Ltd., are showing new versions of their "Marquis" and "Viscount" electric cookers. These Mark III models have the sleek "square-line" body design, glass-fronted facia panels with eye-level controls, and a halo-type indicator light round the oven knob. A new feature of the "Marquis," which has four radiant plates, is the fluorescent hob lighting. The three-plate "Viscount" is also available with an automatic spit.

The Thompson-Tappen 400 series automatic cooking units are displayed by the John Thompson Instrument Co., Ltd. These units can be hung on the wall at the required height and the hotplate slides in and out like a drawer. A hinged chopping board is fitted to the hob and in the oven is an eye-level rotary spit.

Moffats "Fiesta" cooking unit may also be hung on the wall, built-in or mounted on a base unit. The oven of



(Above) Sunbeam  
"Junior Mixmaster"  
food mixer

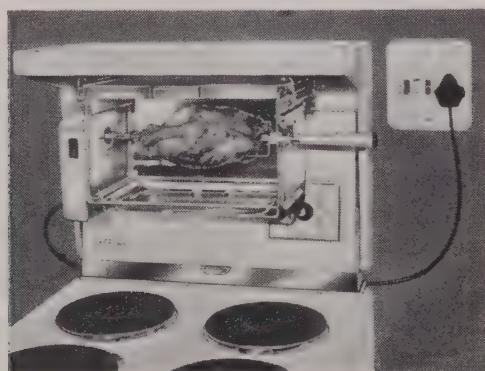


(Right) G.E.C.  
"Treasure 4" elec-  
tric cooker

this cooker has electrically operated shelves enabling them to glide up and down by remote control. Other features of this cooker, expected to sell in the £200-£225 range, are a rotary spit, meat thermometer, automatic clock control and infinitely variable heat switches for the hotplates.

An appliance which is claimed to revolutionise air conditioning in the kitchen is being shown by Gold Star Domestic Appliances, Ltd., in association with Peerless Built-in Furniture, Ltd. It is a ductless cooker hood which incorporates a fan that changes the air in a small kitchen approximately every fifteen minutes. The hood will fit on the wall over any cooker and does not require a hole to be cut into the wall or window as it is completely self-contained with its own filtration plant. It works on the principle of drawing odours, grease and otherwise foul air, by means of its fan, through a filter bed of activated charcoal in which it is purified and blown back into the room again. It is also fitted with a built-in 60 W tube which gives extra light for the cooker, and a pilot light.

As in previous years, refrigerator manufacturers are well to the fore. Kelvinator, Ltd., have on display their recently introduced "Lady K" 3 cu ft refrigerator, in which frozen foods may be kept for periods up to three months, while Lec Refrigeration, Ltd., display models



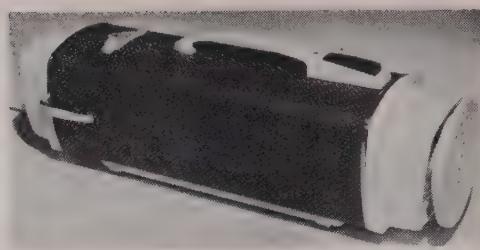
Rotary spit fitted to a Jackson cooker (Electrical Division of Radiation, Ltd.)

ranging from their 2 cu ft "Coronet" to a large-sized 13 cu ft service cabinet.

A.E.I.-Hotpoint, Ltd., are showing their latest "Iced Diamond" refrigerators, and Tricity Cookers have on view a new 1.5 cu ft absorption refrigerator with a wood coloured finish, making it suitable for installation in the dining room or hall.

Electrolux, Ltd., now offer seven refrigerators in sizes ranging from 1½ to 7½ cu ft. Their latest model, the "Sixteen," has been designed specially for the smaller kitchen. It can be mounted on a cabinet or hung from a wall. There is also a version of this 1.6 cu ft refrigerator which can be incorporated in kitchen fittings. The Electrolux "Dishmaid" dish washer introduced to the public at this exhibition is also being continuously demonstrated. It is expected that the first models will be obtainable, in London and the South East, from May onwards.

A new dish-washing machine is shown by Acme Domestic Equipment, Ltd. It has "square-line" styling, automatic operation, and a glass lid and it requires no special plumbing. The capacity is over 100 assorted pieces



Goblin (B.V.C.) model G.72 vacuum cleaner fitted with "Filt-air" attachment

of crockery, cutlery, etc., and it is priced at £125. This company also show their new "Minor" clothes washing machine which has a capacity of 5-6 lb dry weight of clothes and embodies automatic wash control, water heating and emptying. A mobile version of the "Dishlex" dish-washing machine has been introduced. It has a lift-up lid and, unlike the company's other model, it does not require plumbing. It has a new type of cutlery container and the total loading is 2.6 kW.

The new Hoover "Keymatic" fully automatic washing machine is being continuously demonstrated, as well as a new version of the company's "Hoovermatic" combined washing machine and spin dryer. Hoover are also showing to the public for the first time their new "Hooverette" vacuum cleaner. This machine can be used as an upright cleaner or as a hand cleaner slung from the shoulder by a carrying strap.

The Singer Sewing Machine Co., Ltd., enter the domestic appliance field with the introduction of three new vacuum cleaners. One of these, the "Magic Carpet," is an upright cleaner and is fitted with a headlight.

This year is the diamond jubilee year of Goblin (B.V.C.), Ltd., and they are presenting three new cleaners. A special feature of these models is the "Filt-air" attachment. It is claimed that with this fitting germ-laden exhaust air from the vacuum cleaner is avoided and the device diffuses the air to such a degree that unswept displacement is prevented. The new models are the G.72 with accessory tools, including a "Deep-clean" nozzle, and the G.71. Both these are in the popular "D" shape. The smaller model G.54 has all the essential accessories and for this the "Filt-air" feature is an optional extra.

Bylock Electric are showing a novel type of vacuum cleaner built into a coffee table suitable for use in flats or where space is limited. The hose and five accessories are housed beneath a hinged lid. A 300 W motor is fitted and disposable paper dust bags are used. A transparent window in the bag shows when it is necessary to replace it.

Berry's Electric, Ltd., in addition to their display of "Magicoal" fires and radiators, are demonstrating their "Magicmaid" food mixer, while elsewhere in the exhibition Sunbeam Electric, Ltd., feature a new lightweight "Junior Mixmaster" food mixer produced to meet the needs of the smaller family.

Several companies are exhibiting lighting fittings and on the stand of Vactlight (Lighting), Ltd., there is a new collection of contemporary and traditional fittings which include chandeliers, wall brackets and standard lamps. Preston Industrial Research, Ltd., are showing both straight and circular portable plug-in fluorescent units.

The exhibition closes on Monday, 3rd April.

# EUROPEAN POWER SUPPLIES

## CONSUMPTION MORE THAN DOUBLING EVERY TEN YEARS

**C**ONSUMPTION of electricity in Europe (the U.S.S.R. included) rose by 8·5 per cent in 1959 and in the first half of 1960 it was rising far more rapidly. In giving these figures the Economic Commission for Europe\* say that it appears likely that total requirements for electrical energy will "advance rapidly during 1960-61 and perhaps beyond."

During 1959 the increase in Europe's industrial output averaged 6 per cent (shared fairly equally by all sectors except mining and textiles) and two sectors particularly important as electricity consumers, chemicals and basic metals, rose by 12 and 7 per cent respectively. Consumption per employee rose between 6 and 8 per cent in several countries.

The report points out that the influence of temperature on consumption is most marked in certain predominantly thermal power countries. In the United Kingdom it was found that gross consumption varied more with temperature than with industrial production. It varied by 2·1 per cent for each degree of change in temperature (production held constant) and by 0·6 per cent for every one per cent variation in production (temperature held constant).

### Gas Turbines

In 1959 the increase in Europe's generating capacity (withdrawals excluded) was 9 per cent, which was higher than in the previous year. Increased security of supply at times when high demand and adverse climatic conditions coincide continues to be one of the main factors influencing the types of plant brought into service. Of various continuing economy-promoting trends observable in new conventional steam generating units, the report notes an extended use of automatic control devices covering all stages from the fuel input to the steam before the turbines, including firing alterations due to load changes, and increased attention to the design of special peak-load thermal plant. A review of recent technical trends in gas turbine power plants was prepared for the present survey and the E.C.E. believe that increased attention to their possibilities, including their combination with conventional steam cycles, might now be worth while.

Adverse hydraulic conditions having been the rule over most of Europe except in the extreme south-west, thermal plants provided most of the increased output during 1959. Supplies to the public network from "self-producers" were also much increased. Quantities of heat furnished from district heating networks were up by between 5 and 10 per cent. In contrast to 1958 there was, in general, a sharp rise in the use of various types of fuel from the plentiful stocks available. Although both high- and low-grade coals were increasingly consumed, by far the greatest increases, in some cases amounting to 70 per cent or more, occurred in the use of liquid fuels and natural gas.

The position at 1st January, 1960, indicates that in the ensuing five years aggregate new capacity (withdrawals excepted) will exceed 50 per cent of that now in service in several countries and in the total there is, in general, a marked emphasis on different types of plant for peak-load use. Under present conditions the interplay of technical and economic factors is leading to some re-examination of unused hydro-electric resources in certain countries and to an extension of the total resources thought worth exploiting. The prospects of conventional steam generating plant, due to the interplay of technical progress, economies of scale in construction and operation and extended fuel supplies, continue to be a key factor in the economic balance between different kinds of generating equipment.

During 1959 there was some emphasis in various countries on the extension of extra-high-voltage networks (those above 220 kV) so that, not including the long connecting lines at 500 kV built recently in the U.S.S.R., the European systems at extra high voltages now exceed 9,000 km in length, or well over 6 per cent of the total transmission networks in service (110 kV or over). The index of total plant interconnection by the end of 1959 had reached a level of 75 per cent or over in practically all cases.

A combination of adverse hydraulic conditions and rapidly growing industrial activity in 1959 led to a swift growth of international exchanges of electrical energy both within Europe's closely interconnected area and elsewhere. As a result, total cross-frontier exchanges rose to  $11\cdot7 \times 10^9$  kWh or by about 20 per cent and demonstrated the flexibility that is possible in mutual assistance between closely interconnected countries. One such case was that of Switzerland, where an exceptional short-term combination of climatic conditions and rising internal requirements led to a partial reversal of the normal seasonal pattern of net exports, so that total imports from five countries rose to more than one-fifth of requirements over the five months beginning October, 1959.

### Interconnection

To the east of the main interconnected area a programme for the systematic linking-up by 1964 of Czechoslovakia, Hungary, Poland and Eastern Germany, including a link line between Czechoslovakia and Roumania via the Ukraine, was carried a stage further by mid-1960. The spreading of national networks in South-East Europe is also improving prospects for linking the complementary supply systems of that region, of which the connection now effected between Northern Greece and Yugoslavia provides the first tangible evidence. New cross-frontier lines completed during 1959 in Northern Europe similarly presage a considerable increase in co-operation in this field between Finland, Norway and Sweden in the next few years.

In 1959, capital expenditure for electrical power supply in Europe was above the high level of recent years, so that in a number of countries it continued to increase relatively

\* "The Situation and Prospects of Europe's Electric Power Supply Industry in 1959/60." Economic Commission for Europe. H.M. Stationery Office, price 7s.

to the rising proportion of total domestic investment in a gross national product that was itself larger in real terms. Taking a long-term view, the report points out that this is an inevitable consequence of the fact that consumption is rising more quickly than national product and often too quickly for increased efficiency and productivity of supply systems to cancel out the difference. By their effect on the cost of capital, moreover, short-term economic measures by governments to maintain equilibrium and growth potential tend to cut across the smooth allocation of resources needed to meet a steady growth in electric power requirements.

It would appear that in allocating limited capital resources the balance between immediate economy and security of firm supply facilities on the one hand and the likely evolution of current technical trends on the other must—for some time to come—pose a more complex problem than in earlier years for many countries, and thus justifies attention being focused on all possible techniques of realistic project evaluation.

## Irradiation Experiments

THE investigation of the effects of in-pile irradiation on fissile and non-fissile materials was discussed in a paper entitled "Design of Irradiation Experiments," by J. R. Atkinson, B.Sc., Ph.D., and S. Rigg, A.M.I.Mech.E., B.Eng., which was read before a meeting of the Nuclear Energy Group of the Institution of Mechanical Engineers last week. The effect of radiation upon a uranium-type fuel element due to the release of fission fragments was that, where a single uranium atom originally existed in the lattice structure, two fission-product atoms had now to be accommodated.

These had either to find room for themselves within the original lattice or eventually had to escape, for example, by diffusion to the surface. Further, severe local heating had to accompany the loss of kinetic energy of the fission-product atoms. Heating would also be produced within the uranium owing to interactions of both  $\gamma$  rays and  $\beta$  particles with the uranium atoms. In addition, the fast and slow components of the neutron spectrum could interact with the atoms of the uranium lattice without producing fission. These effects could produce swelling or growth.

With non-fissile materials, irradiation could again produce a wide variety of effects. Neutrons could be captured or scattered, thereby promoting excitation or displacement of atoms within their local structure. The phenomenon of stored energy in graphite was by now almost a classic example of this. The interaction of  $\gamma$  rays and  $\beta$  particles both led to internal heating and therefore could be expected to affect the ultimate nature of structural changes induced by the neutron interactions. For certain materials, for example, beryllium, specific nuclear reactions induced by neutrons might lead to atoms of large atomic volume, for example, helium, being produced.

For a gaseous non-fissile component within a reactor, for example, carbon dioxide, the irradiation phenomena observed were also due to  $\gamma$  rays. As might have been expected, dissociation accompanied by the production of charged radicals took place and a variety of surface-reactions could then follow. With graphite, as in the

Calder reactor, mass transfer of carbon atoms was observed and with small amounts of water vapour present, chemical reactions of the corrosion category were enhanced.

It was to examine some of the phenomena mentioned that research reactors such as "Pluto," "Dido" and the Dounreay materials-testing reactor (D.M.T.R.) had been constructed. In contrast to the use of cyclotrons or synchrotrons, in reactor irradiation experiments, the "target" was situated within the reactor itself and usually all the instrumentation was external to the reactor. Owing to the heat produced, a cooling system had to be regarded as an integral part of the target specimen and this in turn absorbed some neutrons and hence gave rise to flux changes in the target area and further self-heating problems. Radiation effects would, in general, be strongly dependent on temperature. Hence precise definition of temperature and temperature gradients within the experimental specimen was frequently necessary, but owing to the complicated mechanisms of heat generation within both the target and rig structure the design became one of some complexity.

The paper then described the design of experimental apparatus and methods for determining the fluxes and heat generation. The advanced gas-cooled reactor (A.G.R.) fuel cluster experiment was described to show the difficulty of simulating operating reactor conditions in a materials-testing reactor.

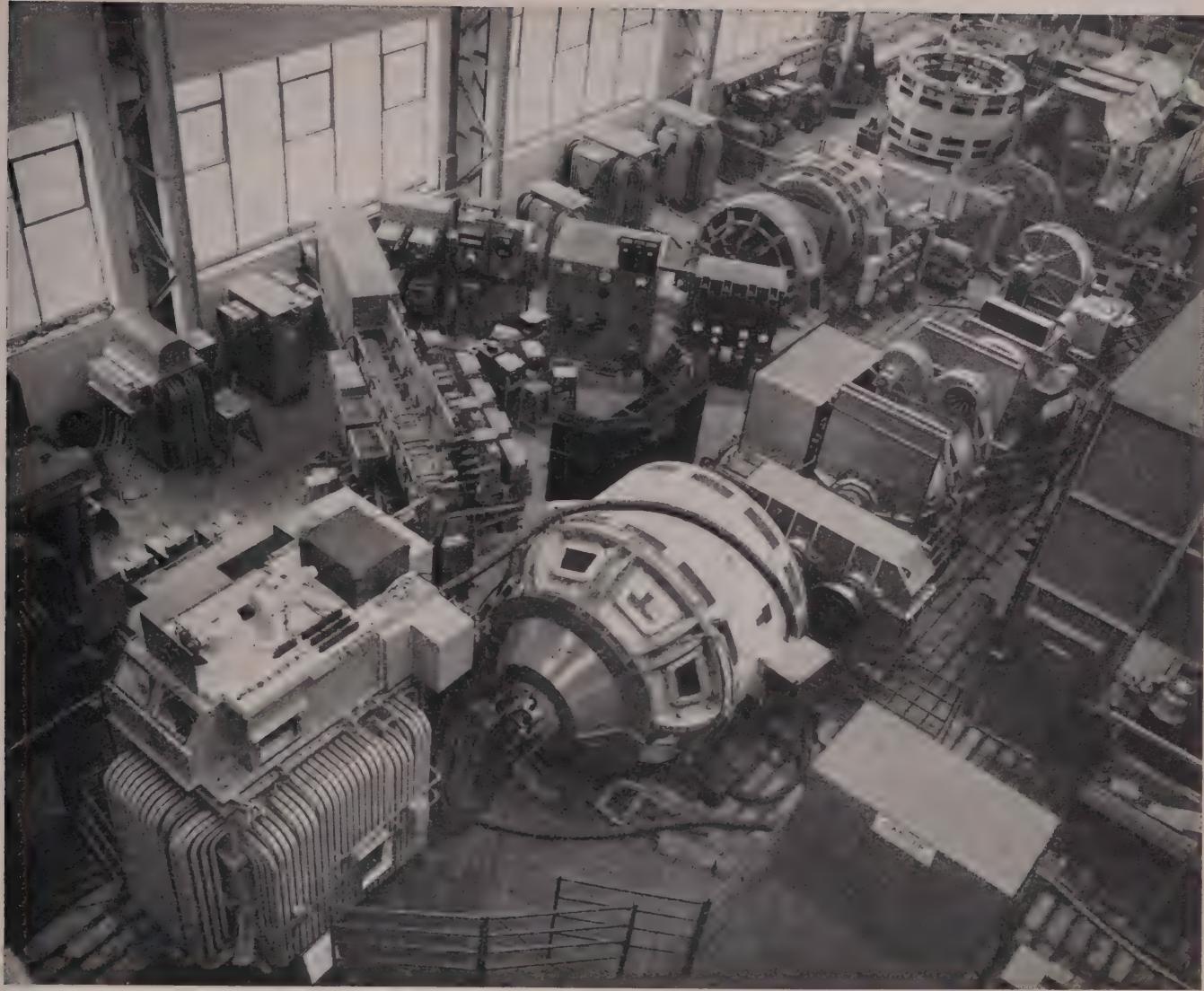
## FUEL EFFICIENCY

THE third volume of the review of combustion and use of fuel published annually by the Federation of British Industries, 21, Tothill Street, S.W.1, at 7s 6d, is now available under the title of "Fuel Economy 1961." Its contents include ten signed articles relating to such subjects as the physical and chemical structure of coal, natural gas and its transport, causes and effects of impure steam, corrosion due to sulphur in flue gas, integration of steam and power production in industry, increasing problems of disposal of factory refuse and the use of radiant space heating in works.

In a foreword reference is made to conclusions reached last year by the energy advisory commission of the O.E.E.C. that no persistent long-term shortages of primary energy are probable up to 1975 and that the paramount consideration for a long-term policy should be plentiful low-cost energy with freedom of choice to consumers of the fuel best suited to their needs—a policy always advocated by the F.B.I.

In a free market with supplies assured, consumers' decisions rested not only on price differentials but also on their trends. Coal prices had varied between 1913 (index 100) and 1958 in relation to all other wholesale prices in major coal-producing countries in the following proportions:—France, 176; Belgium, 178; the Ruhr, 179. These compared with 214 in the United Kingdom, whereas the price of crude oil had varied very closely with the average of all other prices.

Natural gas developments seemed likely to be greater than originally anticipated and to be limited only by problems of finding markets and of long-distance transport. This additional competition would tend to stabilise European energy prices.



A section of the L.S.E. Heavy Machine Test Bed. In the foreground, a 2400/1050 h.p., 450/345 r.p.m. N-S variable-speed a.c. motor (one of four for Uskmouth

Power Station, driving Gwynnes pumps). The control scheme incorporates L.S.E. 'Asmag' automatic control gear.

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# NEXT WEEK'S EVENTS

*Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged*

**MONDAY, 20th MARCH**

**Birmingham.**—Grand Hotel. Birmingham Electric Club. Annual meeting followed by an address by C. L. Davies.

**Brigg.**—Angel Hotel, 7 p.m. I.E.E. North Midland Centre. Inaugural address by F. W. Fletcher.

**Bristol.**—Demonstration Theatre, Electricity House, 6 p.m. I.E.E. Western Supply Group. "Construction of Nuclear Power Stations," by D. M. Longman.

**Gardiner, Sons & Co. Showroom.** I.E.S. Bath and Bristol Centre. Symposium with architects.

**Cardiff.**—South Wales Institute of Engineers, Park Place, 7 p.m. Institute of Marine Engineers, South Wales Section. "Details and Operating Data of Recent A.C. Installations," by A. N. Savage.

**Gateshead.**—Technical College, Durham Road, 6.45 p.m. Institution of Production Engineers, Northern Region. Annual meeting and chairman's address, followed by a tour of the College workshops and laboratories.

**Great Malvern.**—Winter Gardens, 7.30 p.m. I.E.E. South Midland Centre. Electronics and Measurement Group. "Radio Communication by means of Satellites," by A. W. Lines.

**Ipswich.**—Electric House, 7.15 p.m. Ipswich and District Electrical Association. "Electric Floor Warming," by L. Shepherd.

**Leeds.**—British Lighting Council, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Presenting the Revised Code of Practice for Lighting in Buildings," by H. Hewitt.

**Houldsworth School of Applied Science, Leeds University.** 7.30 p.m. Institution of Plant Engineers, West and East Yorkshire Branch. Annual meeting.

**London.**—Institution Building, Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. "Automatic Trunk Dialling," by H. E. Francis.

**Manchester.**—College of Science and Technology, 6.15 p.m. I.E.E. North Western Centre, Education Discussion Circle. Discussion on "Experimental Methods with Particular Reference to Transistors," to be opened by V. H. Attree.

**Newcastle-on-Tyne.**—Rutherford College of Technology, Northumberland Road, 6.15 p.m. I.E.E. North Eastern Measurement and Electronics Group. "New Amplifying Techniques," by Prof. C. W. Oatley.

**Reading.**—George Hotel, King Street, 7.15 p.m. I.E.E. Reading District. "The Development of Eurovision," by M. J. Pulling.

**Stafford.**—County Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Joint meeting with the Graduate and Student Section. Short papers.

**TUESDAY, 21st MARCH**

**Bangor.**—Department of Electronic Engineering, University College of North Wales, Dean Street, 5.30 p.m. I.E.E. Mersey and North Wales Graduate and Student Section. "Recovery Properties of High Current Spark Gap Switches," by R. J. Churchill.

**Bedford.**—Swan Hotel, 7 p.m. I.E.E. East Midland Electronics and Control Group. "Silicon Controlled Rectifiers," by R. G. Hibberd.

**Bristol.**—Royal Hotel, 7.30 p.m. Institute of Metal Finishing, South West Branch. "Rectifiers in the Metal Finishing Industry," by D. Ashby.

**Coventry.**—Herbert Lecture Theatre, Earl Street, 6.30 p.m. I.E.E. South Midland Centre, Electronics and Measurement Group. "Bridging the Atlantic," by A. H. Mumford.

**Edinburgh.**—Usher Hall. I.E.E. Scottish Centre. Faraday Lecture. "Transistors and All That," by L. J. Davies.

**Farnborough.**—Technical College, 6.15 p.m. I.E.E. Southern Centre. "Recent

Research in Thermionics," by G. H. Metson and Miss E. Macartney.

**Hull.**—Lecture Theatre, Y.E.B. Offices, Ferensway, 6.30 p.m. I.E.E. North Midland Centre. "The Transmission of News Film over the Transatlantic Cable," by C. B. B. Wood.

**Leeds.**—Leeds and County Conservative Club, South Parade, 6.30 p.m. I.E.E. North Midland Centre, Utilisation Group and Graduate and Student Section. "Arc Control," by P. J. Mackertich, and "Line Drop Compensation," by J. E. Taylor.

**Liverpool.**—M.A.N.W.E.B. Electrical Industrial Development Centre, Paradise Street, 6 p.m. I.E.S. Liverpool Centre. "Characteristics and Applications of Photo-Cells," by F. A. Benson.

**London.**—Savoy Place, W.C.2, 5.30 p.m. I.E.E. London Measurement and Control Section. Discussion on "Self-Adaptive Control Systems," to be opened by J. H. Westcott, J. L. Douce, P. E. W. Grinsted and P. H. Hammond.

**Manchester.**—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "An Instrument for Measuring Voltage and Current on Very Low Frequency Three-Phase Supply," by J. Rawcliffe. Exhibition of permanent magnet materials, controlled expansion alloys, magnetostriction alloys and high permeability alloys, etc.

**TUESDAY, 21st MARCH to SATURDAY, 25th MARCH**

**London.**—Earls Court, S.W.5. Tenth Electrical Engineers Exhibition. Opening, 21st March, by the Rt. Hon. F. J. Erroll.

**WEDNESDAY, 22nd MARCH**

**Birmingham.**—Electrical Engineering Department, University of Birmingham, 6.15 p.m. British Institution of Radio Engineers, West Midlands Section. "A Pulse Time Multiplex System for Stereophonic Broadcasting," by G. D. Browne.

**Bournemouth.**—Grand Hotel, 6.30 p.m. I.E.E. Southern Centre. "Radiocommunication in the Power Industry," by E. H. Cox and R. E. Martin.

**Bristol.**—Grand Hotel, Broad Street, 6.15 p.m. Institution of Plant Engineers, Western Branch. Annual meeting, followed by a talk on "Closed Circuit Television," by I. M. Waters.

**Chatham.**—Medway College of Technology, 7 p.m. I.E.E. London Graduate and Student Section, Chatham District. "Servos for Trainable Mountings with Special Reference to the 'Bloodhound' Launcher," by K. J. Bartlett.

**Farnborough.**—Technical College, 7 p.m. British Institution of Radio Engineers, Southern Section. "The Design of a Long Range Single Sideband Airborne Equipment," by P. D. Adams and T. E. Wynne.

**Glasgow.**—Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 6 p.m. I.E.E. South West Scotland Sub-Centre. "A General Theory of Depreciation of Engineering Plant," by D. Rudd.

**Lincoln.**—E.M.E.B. Showrooms, 7.30 p.m. I.E.E. East Midland Centre. "An Engineering Project in India," by H. E. Knight.

**London.**—Savoy Place, W.C.2, 5.30 p.m. I.E.E. London Electronics and Supply Sections. "The Engineering Aspects of Plasma Physics," by R. Carruthers and D. L. Smart.

Cromwell Room, Earls Court, 6.30 p.m. Association of Supervising Electrical Engineers. "Electrical Installations for Large Industrial Projects," by Sir Henry Clay.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 5.30 p.m. British Institution of Radio Engineers, Computer Group. "The Future of High Speed Storage Systems."

Bonnington Hotel, Southampton Row, W.C.2, Institute of Electricity Administration. "Some Aspects of Contracting Work," by L. E. W. Humphries.

**Middlesbrough.**—Cleveland Scientific and Technical Institute, Corporation Road, 7.30 p.m. Society of Instrument Technology, Tees-Side Section. Annual meeting followed by "Some Impressions of Instrumentation in the U.S.S.R.," by E. N. Martin.

**THURSDAY, 23rd MARCH**

**Birmingham.**—College of Advanced Technology, Gosta Green, 6 p.m. I.E.E. South Midland Centre, Education Discussion Circle. Discussion on "The Integration of Industrial and Academic Training."

**Cambridge.**—Cavendish Laboratory, 8 p.m. I.E.E. Cambridge Electronics and Measurement Group. "Advances in Semiconductor Devices and Circuits," by J. Evans.

**Chester.**—Belle Vue Hotel, London Road, 7.30 p.m. Institution of Production Engineers, South Western Region. Annual meeting followed by films: "The Dounreay Sphere" and "The Whessoe Story."

**Inverness.**—Station Hotel. I.E.E. North Scotland Sub-Centre. Centre chairman's address by R. B. Anderson.

**London.**—Dorchester Hotel, Park Lane, 6.30 for 7 p.m. Electrical Wholesalers' Federation. Annual dinner.

**Malvern.**—Winter Gardens, 7 p.m. British Institution of Radio Engineers, South Midlands Section. "Magnetic Film Storage," by A. C. Moore.

**Weymouth.**—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "High Voltage Engineering," by E. L. White.

**Wirral.**—Associated Ethyl Co., Ltd., Oil Sites Road, Ellesmere Port, 7 p.m. Society of Instrument Technology, Chester Section. "Electromagnetic Flowmeters," by L. M. Bennett.

**FRIDAY, 24th MARCH**

**Bristol.**—Grand Spa Hotel, Clifton, 7 p.m. I.E.E. Western Centre. Annual dinner and dance.

**Glasgow.**—Building Centre, Sauchiehall Street. Society of Instrument Technology, Scottish Section. Annual meeting followed by a report on the Moscow Congress by Prof. G. D. S. MacLellan.

**London.**—Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. "A New Theory of the Origin of the Planetary System," by Prof. R. O. Kapp.

**Newcastle-upon-Tyne.**—Grey Hall, King's College, 6.30 p.m. I.E.E. North Eastern Graduate and Student Section. "Fundamentals of A.C. Railway Traction Rectifier Equipments," by K. Gunary.

Mining Institute, 6.15 p.m. North East Coast Institution of Engineers and Ship-builders. "Fuel Cells," by Dr. H. H. Chambers.

**Portsmouth.**—Guildhall. Electrical Industries Benevolent Association, Hants., Dorset and Wilts. Branch. Ball.

**Port Sunlight.**—Hulme Hall, Bolton Road, 7 p.m. I.E.E. Mersey and North Wales Centre. Dinner-dance.

**Sheffield.**—University, St. George's Square, 7 p.m. Society of Instrument Technology, South Yorkshire Section. Annual dinner.

**St. Mellons.**—County Club, Newport and District Electric Club. Annual dinner-dance.

**SATURDAY, 25th and SUNDAY, 26th MARCH**

**Glasgow.**—"Chesters," Bearsden. I.E.E. Scottish Electronics and Measurement Group and U.K.A.E.A. Experimental Reactor Establishment at Dounreay. Symposium on the "Instrumentation and Control of Nuclear Reactors."

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

**Australia.**—Commonwealth Railways, Melbourne. 18th April. Three diesel-electric locomotives. (E.S.B. 8212/61.)\*

**Basildon.**—U.D.C. 10th April. Street lighting equipment. (See this issue.)

**Bedlington.**—U.D.C. 21st April. Supply of electrical goods, electric cookers and boilers for the year ending 31st March, 1962. A. K. Dennis, engineer and surveyor, Council Offices, Front Street, Bedlington, Northumberland.

**Cambodia.**—31st March. Société Commerciale Khmère and Ets. Vinh-hoi (Du Duong Gra). Fluorescent lamps. 6th May. Huot-Ham (Ets. An-Heng). Fluorescent lamps and starters. (E.S.B. 8101/61/I.C.A.)\*

**Dartford.**—Borough Council. 10th April. Modernisation of 71 houses on the Lowfield Street estate, including rewiring. Town clerk, Council Offices, Dartford, Kent.

**Formosa.**—Central Trust of China. 8th April. Electronic equipment, meters, etc. (E.S.B. 7748/61/I.C.A.)\*

**Fylde.**—R.D.C. 27th March. Class "A" and Class "B" street lighting, Newton, War-ton, Greenhalgh-with-Thistleton, Treales, Roseacre and Wharles, Singleton, Little Eccleston-with-Larbreck, Elswick and Stain-ing. Engineer and surveyor, 29a, Station Road, Kirkham, near Preston.

**India.**—West Bengal State Electricity Board. 28th March. Carrier current communication equipment. (E.S.B. 7369/61.)\*

**Gujarat Electricity Board.** 8th May. Switchgear. (E.S.B. 8188/61.)\*

**Singareni Collieries Co.** 18th April. Cables. (E.S.B. 8214/61.)\*

**Manchester.**—Corporation. 5th April. Cable installations, Davyhulme sewage works extensions. (See this issue.)

**Morley.**—Street Lighting Department. 14th April. Sodium lighting. (See this issue.)

**Nigeria.**—Electricity Corporation of Nigeria. 1st May. Impregnated wood poles. (See this issue.) 3rd May. Transmission line. (E.S.B. 8124/61.)\*

**Pakistan.**—Directorate of Supply. 27th March. Lamps. (E.S.B. 8191/61.)\* 3rd April. Refrigerators and air conditioners. (E.S.B. 7721/61.)\* 11th April. Six motor-driven pumps and a 350 kVA transformer. (E.S.B. 7729/61.)\* 24th April. Two air conditioning units. (E.S.B. 7400/61.)\*

**Peterborough.**—Joint Education Board. 5th April. Electrical installation in extension to Peterborough Technical College. (See this issue.)

**Rhodesia and Nyasaland.**—Federal Tender Board. 24th March. Cable and cable boxes. (E.S.B. 7329/61.)\* 30th March. Electrically operated industrial floor polishers. (E.S.B. 8201/61.)\* Ice-making machine. (E.S.B. 8202/61.)\*

**Bulawayo Electricity Department.** 5th April. P.i. cable and insulators. (E.S.B. 8741/61.)\*

**Salisbury City Council.** 28th March. Electricity meters. (E.S.B. 7767/61.)\* 25th April. Annual supply of electrical equipment, including oil circuit-breakers, transformers, cable boxes, switch trucks, isolator units,

fuse switches and batteries. (E.S.B. 7766/61.)\*

**Que Que Electricity Department.** 4th April. Auto-reclosers. (E.S.B. 8733/61.)\*

**Salford.**—Corporation. 4th April. Supply of electric lamps and cables for the year commencing 1st July next. (See this issue.)

**United States.**—Bonneville Power Administration. 30th March. Control cable. (E.S.B. 8752/61.)\*

**Bureau of Reclamation.** 28th March. Power station equipment. (E.S.B. 7770/61.)\* 11th April. Eight 125 MVA vertical shaft hydraulic turbine driven generators for Glen Canyon power plant. (E.S.B. 7779/61.)\*

### ORDERS PLACED

**Hebburn (Durham).**—U.D.C. Electrical installations in 42 houses in the central redevelopment area (£1,251).—Cook & Nicholson.

**London.**—Metropolitan Water Board. Recommended. Power, control, instrumentation and telephone cables, lighting and telephones, etc., at Walton pumping station (£81,432).—Electrical Installations Accepted. Two 3,000 kVA transformers for Ashford Common and Staines pumping stations (£6,670).—Bonar, Long & Co. Electrically driven 15-ton overhead travelling crane at Staines pumping station (£7,707).—Herbert Morris.

**Sunderland.**—Corporation. Electrical installations in 260 dwellings on Town End Farm estate (£4,363).—John Calvert (Electrical).

**Surrey.**—South West Metropolitan Regional Hospital Board. Electrical services in connection with scheme for the conversion of the Metropolitan Convalescent Home at Walton-on-Thames into a geriatric hospital (£12,001).—Buchanan & Curwen. Installation of lifts (£5,384).—W. J. Furse & Co. (London).

### WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

**Bridgwater.**—Flats, West Street; borough architect, Town Hall.

**Corby.**—Home for old people (£55,000), junction of Forest Gate Road and Cottingham Road; county architect, Northampton.

**Dagenham.**—Library, hall and old people's club, Halburt Street/Barnmead Road site; borough surveyor, Civic Centre.

**Dalkeith.**—Esk Valley Technical School, Lugton (£550,000); Midlothian county architect, 32, Palmerston Place, Edinburgh.

**Doncaster.**—Shopping arcade; T. H. Johnson & Sons, architects, Sheffield.

**East Kesteven.**—Bungalows (37); R.D.C. surveyor, Grantham, Lincs.

**Eccles.**—Offices for rating and housing departments, Irwell Place; borough engineer, Town Hall Annex, Irwell Place.

**Edenbridge.**—Factory for Lewis & Towers, Ltd.; Stirton Partners, Ltd., 871, High Road, N.12.

**Edinburgh.**—Eleven-storey offices, Lauriston Street; Scottish Oils & Shell-Mex, Ltd., 53, Bothwell Street, Glasgow.

**Egham (Surrey).**—Houses (26), Rowan Avenue; surveyor, Fire Station Buildings, High Street.

**Forfar.**—Houses (86), shops, etc., as West End redevelopment; J. Parr, architect, 132a, Nethergate, Dundee.

**Glasgow.**—Multi-storey blocks of dwellings, Wynford; J. A. Bent, Scottish Special

Housing Association, Ltd., 15/21, Palmerston Place, Edinburgh, 12.

**Gloucester.**—Three hostel blocks for College of Domestic Science; H. J. Walker & Sons, Ltd., 58, Broad Street, Staple Hill, Gloucester.

**Hinckley (Leics.).**—Extension to factory; Atkins Bros., Ltd., Lower Bond Street.

**Hoddesdon (Herts.).**—Houses (58), West-field Road/Hertford area; U.D.C. surveyor, Council Offices, High Street.

**Hull.**—Erection of David Lister High School; Lyons, Israel & Elsom, architects, 43, Portland Place, London, W.1.

**Hunts.**—Proposed new primary school at Stilton; county architect, Huntingdon.

**Kidderminster.**—Houses (30), Habberley; borough engineer, 110, Mill Street.

**Knighton (Rads.).**—Rural science block at secondary school; R. J. A. Wilson & Macmillan, architects, 4a, St. Peter's Street, Hereford.

**Leicester.**—Public baths, Ring Road and St. Peter's Lane; city architect.

**Leicestershire.**—New offices, Anstey Frith, 1961-62 programme; county architect, Leicester.

**London.**—Additional factory, Canning Town; Unilever, Ltd., St. Bridget's House, Bridewell Place, E.C.4.

**Margate.**—Dwellings (73), Millmead Road estate; borough engineer.

**Market Harborough.**—Block of old people's flats in Bowden Lane, with community room; U.D.C. surveyor.

**Newcastle-on-Tyne.**—Old people's hostel, Brigham Avenue, Kenton; city architect, 18, Cloth Market, Newcastle-on-Tyne.

**Northampton.**—County library and office block (£150,000), Angel Street (scheme approved in principle); county architect, Northampton.

**Nuneaton.**—Twelve-storey block of flats, Bottrill Street; borough engineer.

**Penzance.**—Flats (70), St. Clare Street; Venn Bros., Ltd., Alexandra Road.

**Peterborough.**—Plans for indoor swimming pool (£200,000), and new bus station; city engineer, Bridge Street.

**Radcliffe.**—Dwellings (98), Chapelfield estate; Unity Structures, Ltd., 5/15, Cromer Street, London, W.C.1.

**Radnorshire.**—Primary school, Newbridge-on-Wye; county architect, County Hall, Llandrindod Wells.

**Richmond (Surrey).**—Dwellings (192), village hall, clinic, etc., Ham Close development; borough engineer, Hotham House, Heron Court.

**Rotherham.**—Works development scheme; Steel, Peech & Tozer, Ltd., The Ickles.

**Houses (202).**—Kimberworth Park estate; borough engineer, Municipal Offices.

**Sheerness.**—Laboratories; Abbott Laboratories, Ltd., 8, Baker Street, London, W.1.

**Sheffield.**—Nine-storey office block, Glossop Road and Durham Road; Husband & Co., consulting engineers, 388, Glossop Road.

**Skegness.**—Factory (£80,000), industrial estate, for letting to Murphy Radio, Ltd.; U.D.C. surveyor.

**Southend-on-Sea.**—Civic centre, Victoria Avenue; borough architect, 30, Alexandra Street.

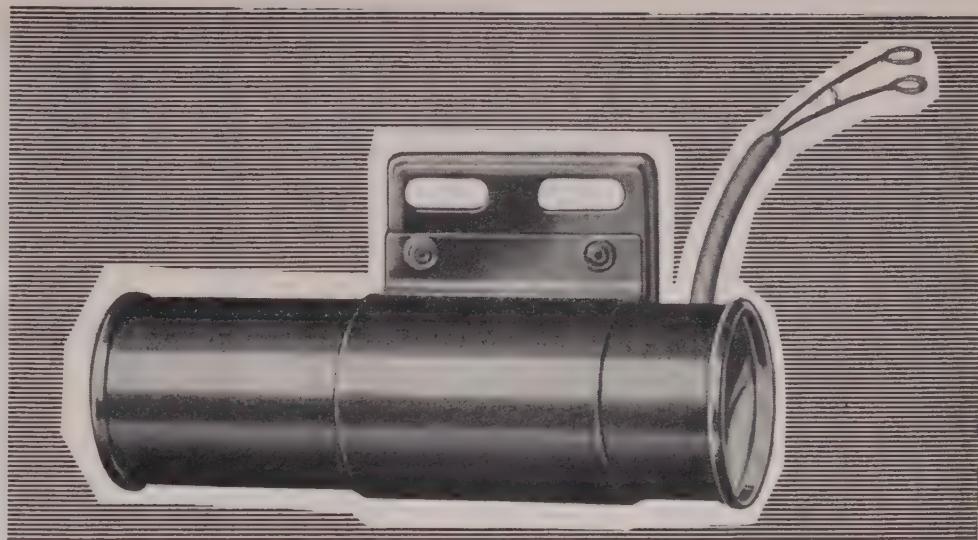
**Sutton Coldfield.**—Flats (36), Lichfield Road, Four Oaks; Bernard Sunley & Sons, Ltd., 75, Colmore Row, Birmingham.

**Thame.**—Extensions to Rycotewood College (£85,000); G. R. Hutton, architect, Park End Street, Oxford.

**Thurso.**—Extensions to Thurso Technical College (£140,000); Allison & Hutchison, architects, 4, Rothesay Terrace, Edinburgh.

\* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

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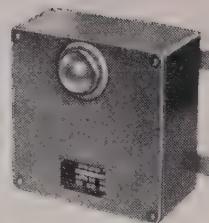
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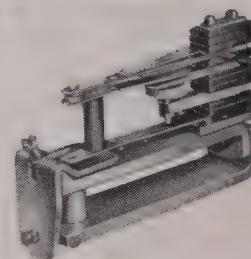
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Stand No. G8  
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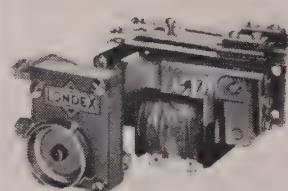
### ELECTRONIC RELAY

Type RE. For use with contact thermometers, sensitive gauge contacts and wherever control is required from very low switching capacity contacts. No filament valves used. List No. 162.



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Type LF/TI. For AC or DC. Mechanical movement, giving up to 5 secs. delay. Max. 3 sets N/O, N/C or C. On de-energising the timing starts and contacts operate at end of delay. List No. 165.



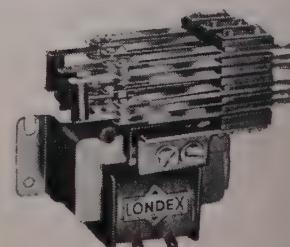
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Type SMM. For AC or DC. Single and double action types available. Snap action switch rated at 15 amps, 250 v. A.C. Used in lift work, interlocking, motor reversing, etc. List No. 178.



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FOR LIGHT

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March 21st-25th

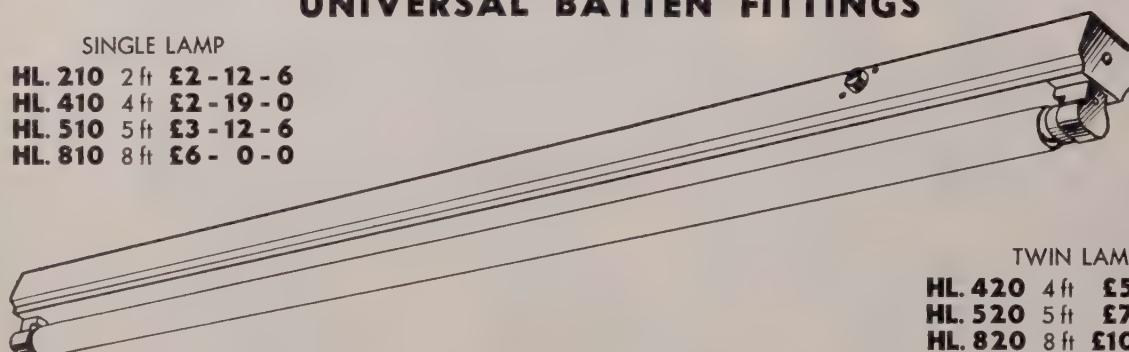
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Complete with switch start control gear

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HL. 410	4 ft	£2 - 19 - 0
HL. 510	5 ft	£3 - 12 - 6
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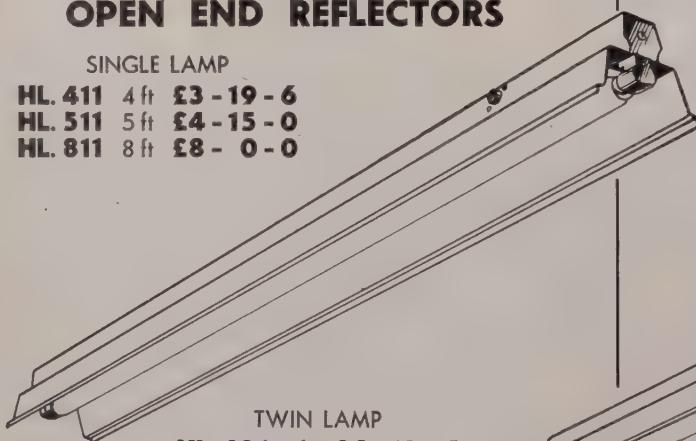
TWIN LAMP

HL. 420	4 ft	£5 - 12 - 0
HL. 520	5 ft	£7 - 0 - 0
HL. 820	8 ft	£10 - 12 - 6

**OPEN END REFLECTORS**

SINGLE LAMP

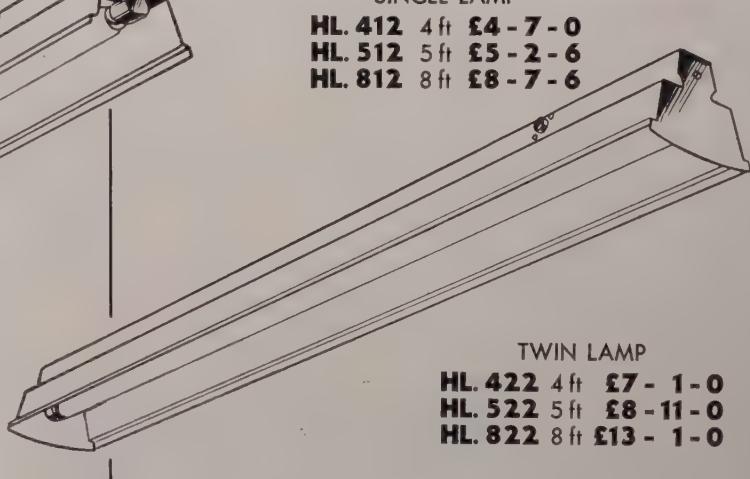
HL. 411	4 ft	£3 - 19 - 6
HL. 511	5 ft	£4 - 15 - 0
HL. 811	8 ft	£8 - 0 - 0



**CLOSED END REFLECTORS**

SINGLE LAMP

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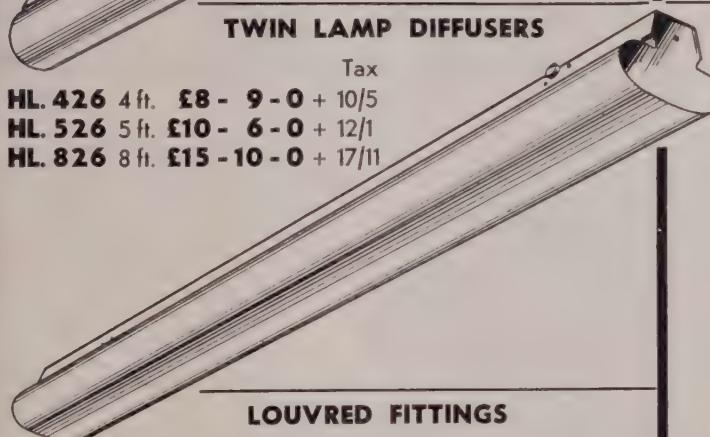
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**SINGLE LAMP DIFFUSERS**

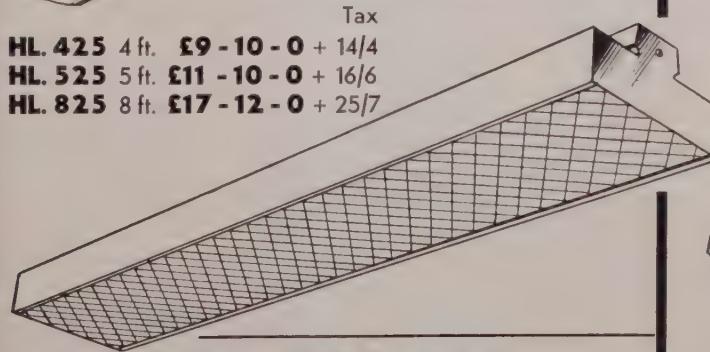
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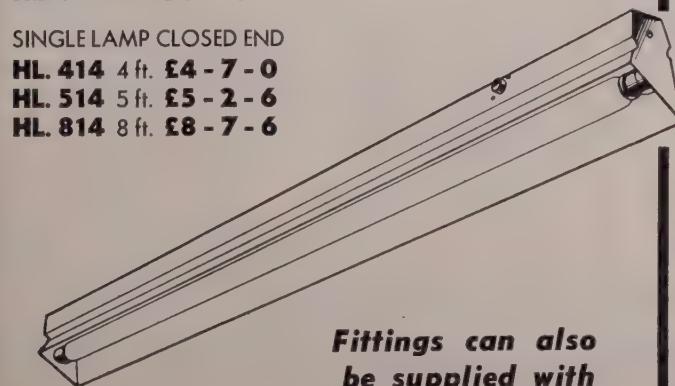
**LOUVRED FITTINGS**

**HL. 425** 4 ft. £9 - 10 - 0 + 14/4  
**HL. 525** 5 ft. £11 - 10 - 0 + 16/6  
**HL. 825** 8 ft. £17 - 12 - 0 + 25/7

**ANGLE REFLECTORS**

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**HL. 513** 5 ft. £4 - 15 - 0  
**HL. 813** 8 ft. £8 - 0 - 0

SINGLE LAMP CLOSED END  
**HL. 414** 4 ft. £4 - 7 - 0  
**HL. 514** 5 ft. £5 - 2 - 6  
**HL. 814** 8 ft. £8 - 7 - 6



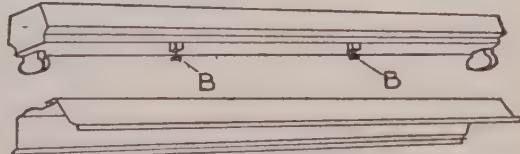
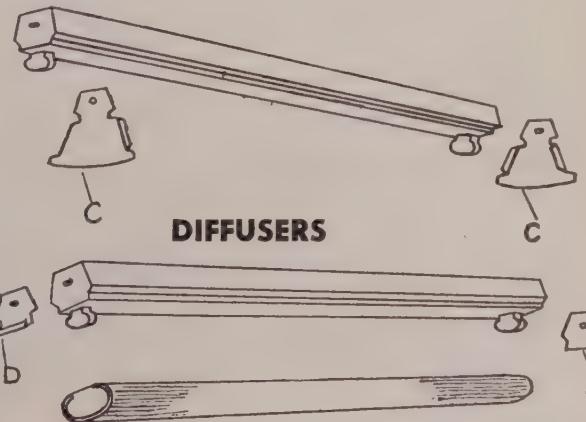
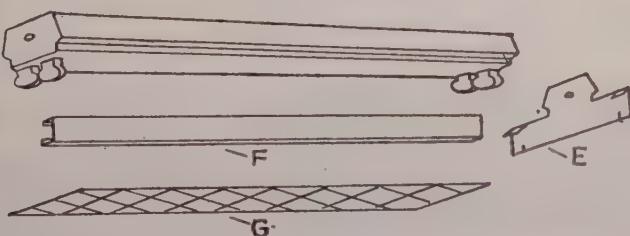
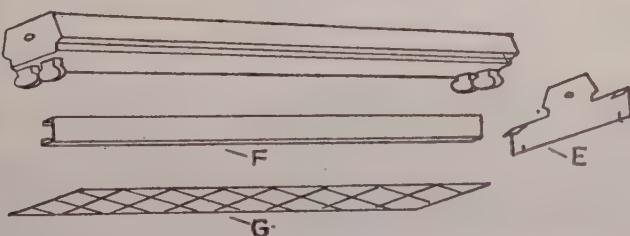
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## Venner **Autopoint** PORTABLE TIME SWITCH



The Time Switch,  
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 In response to trade request  
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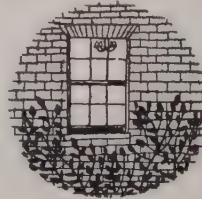
### The Venner **Autopoint**

The Venner Autopoint Time Switch is invaluable to the engineer, and particularly the housewife, who can make good use of a portable means of timing control. The Venner Autopoint will switch any electrical appliance off or on, automatically, at set times, and it can be moved from place to place in the workshop or in the home with perfect ease.

Retail price £5.17.6

complete with 1½ yards of mains lead.

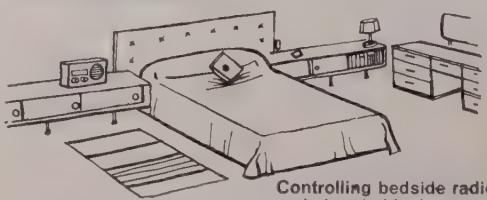
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### NO EXTRAS...

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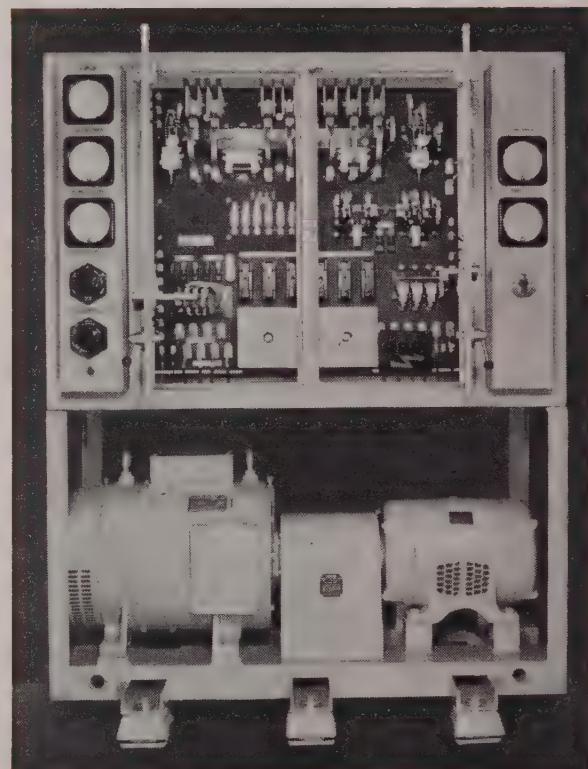
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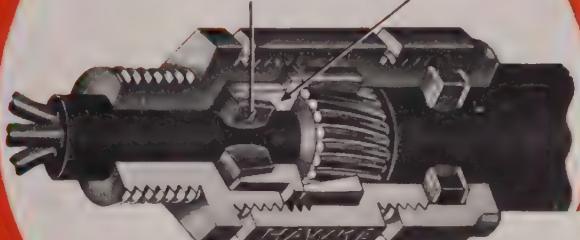
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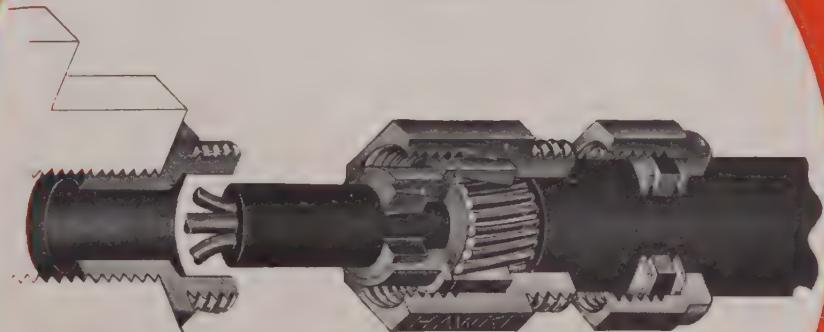
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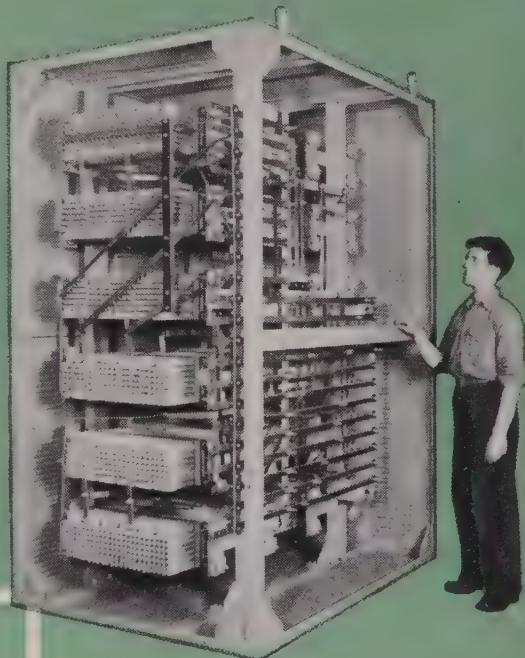


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**RESISTORS**

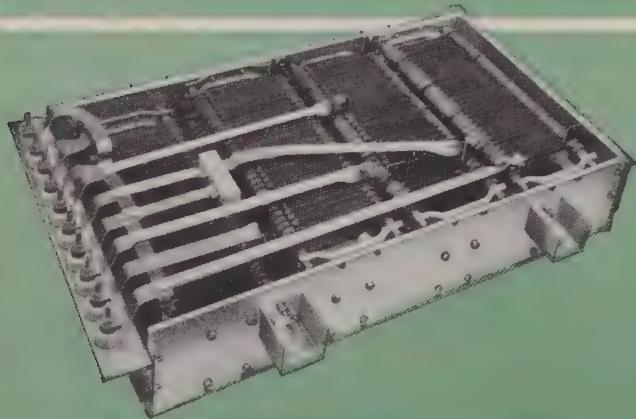
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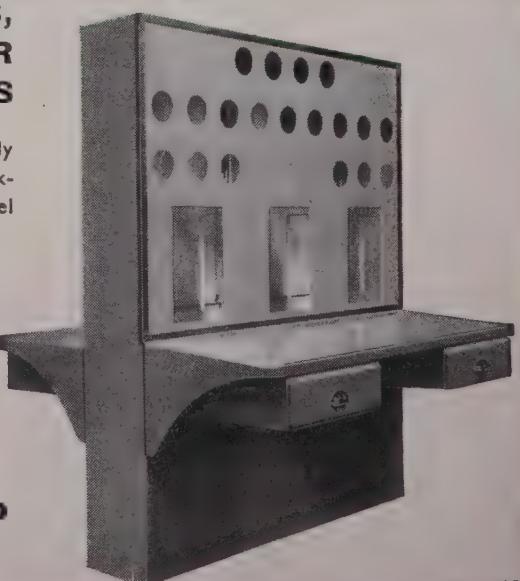
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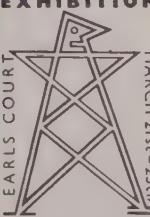
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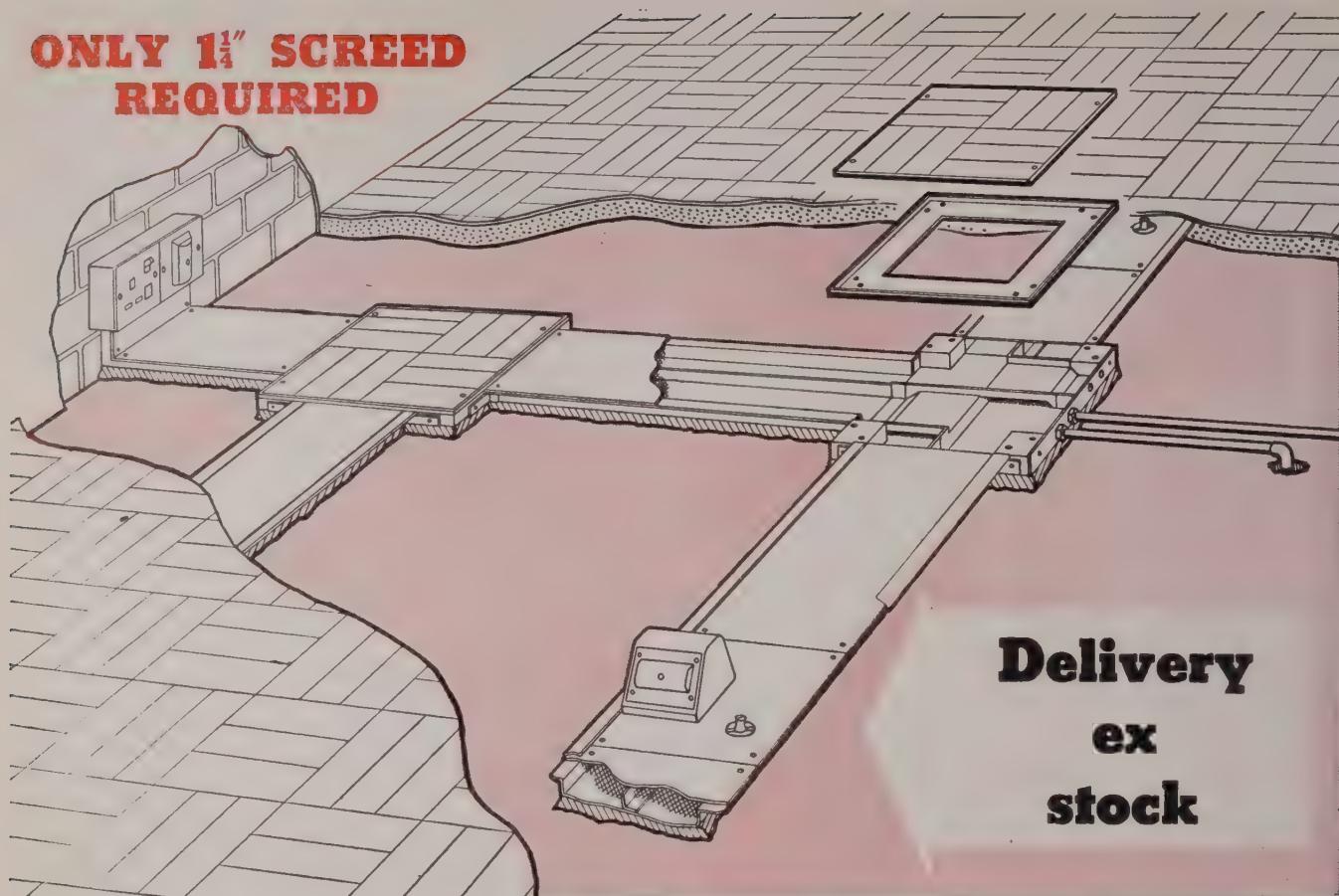
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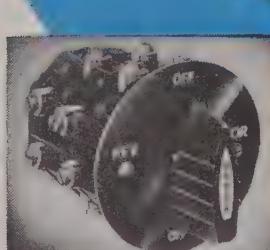
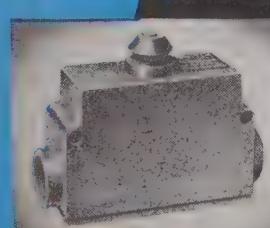
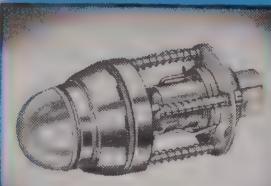
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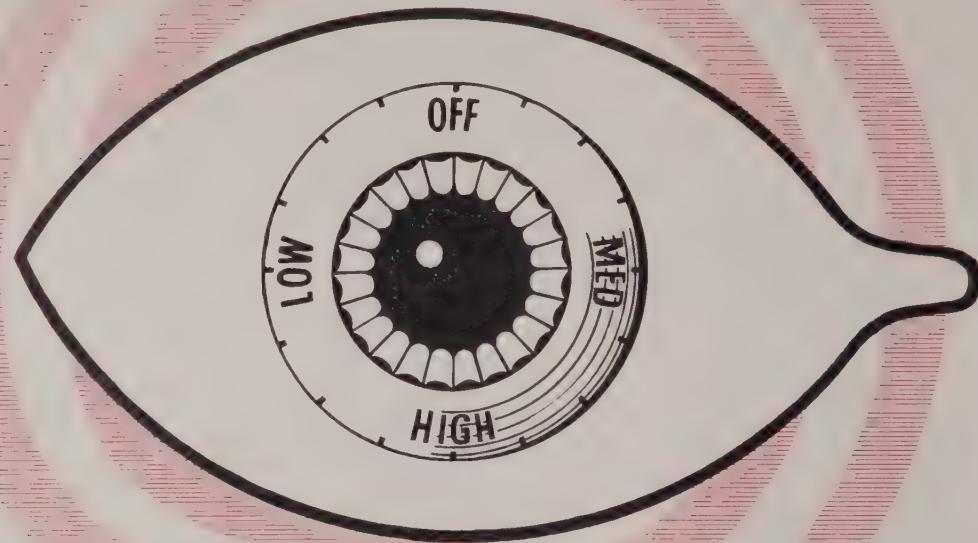
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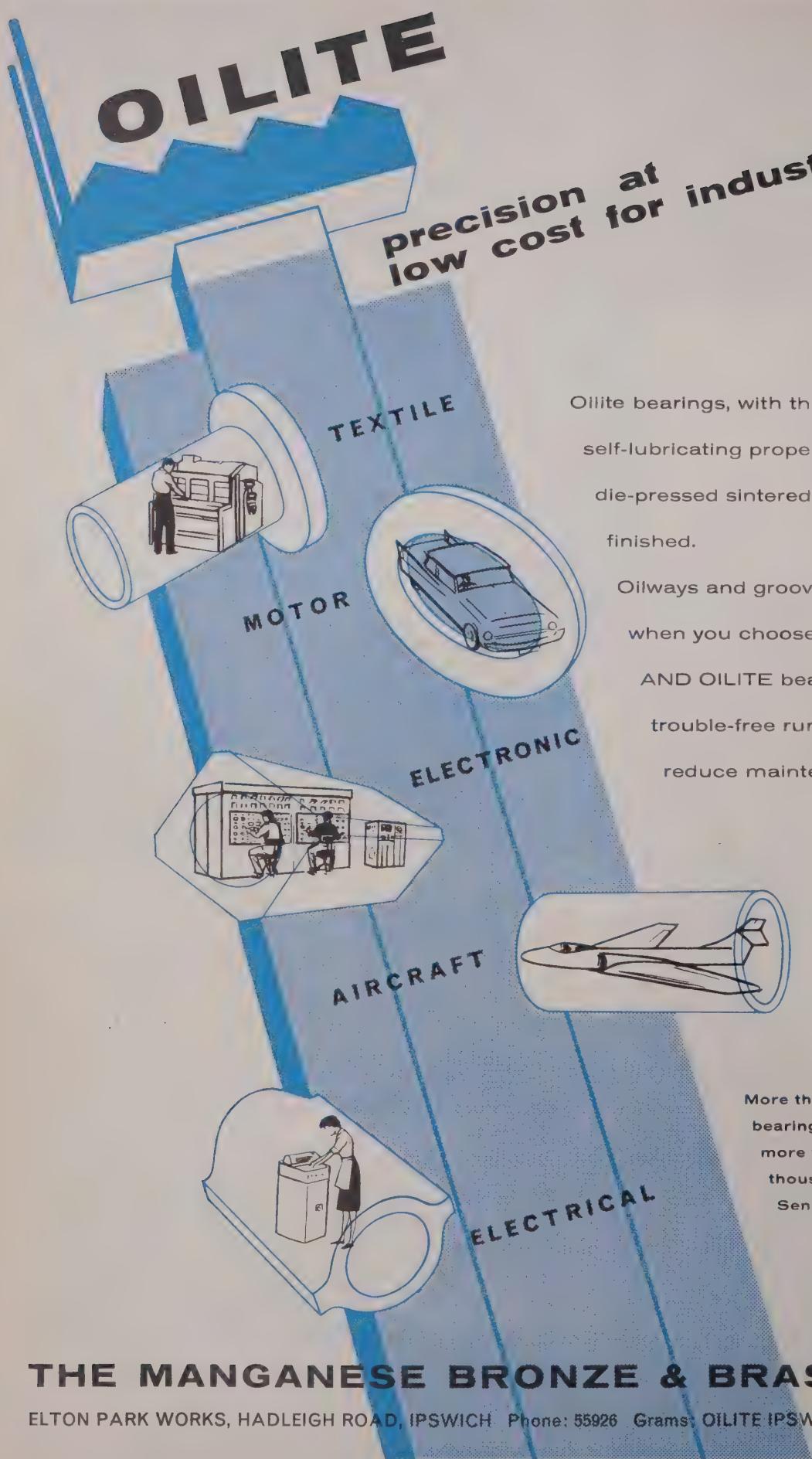
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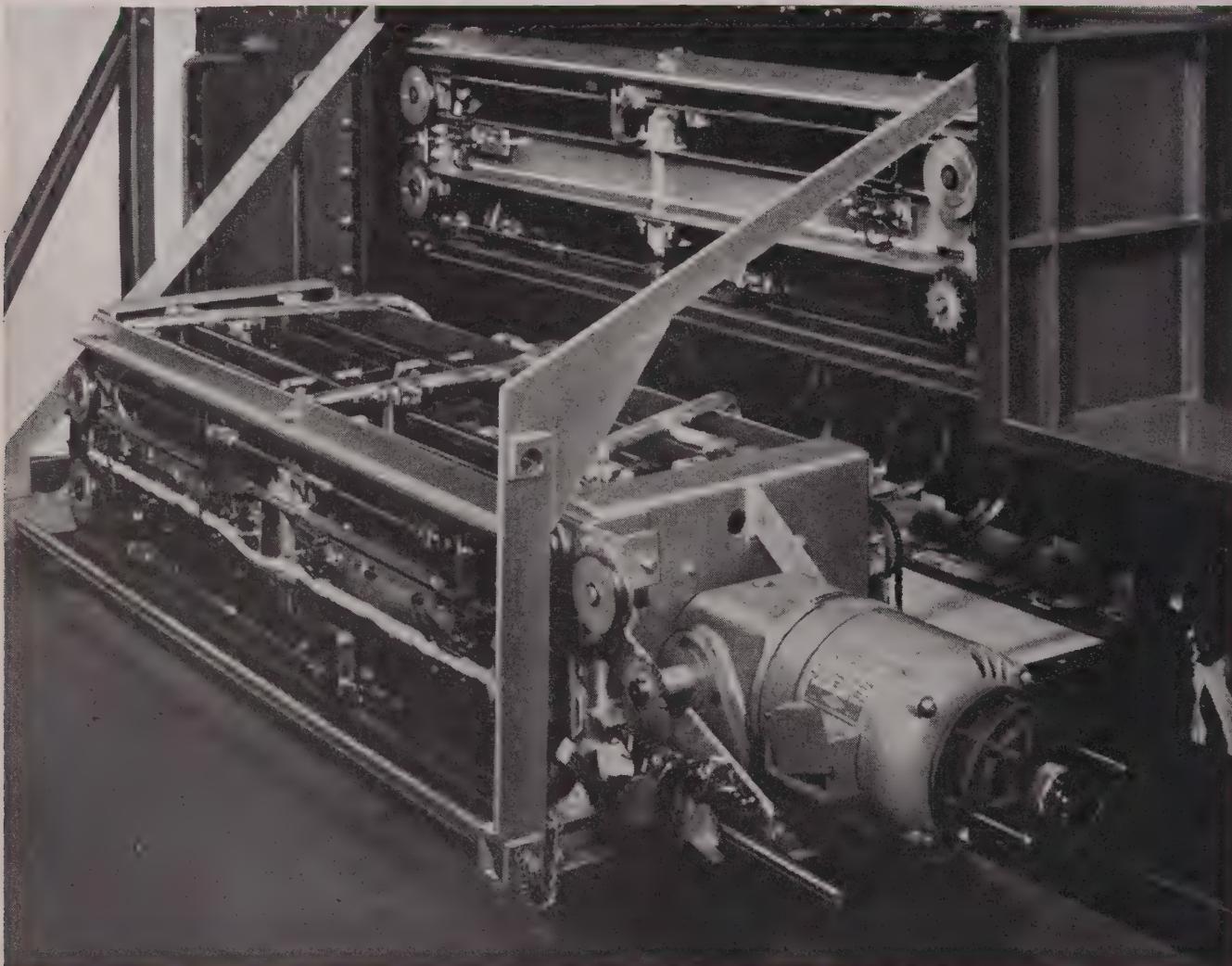
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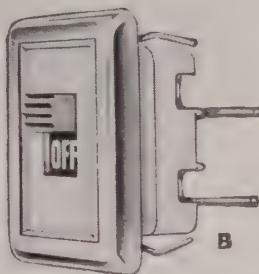
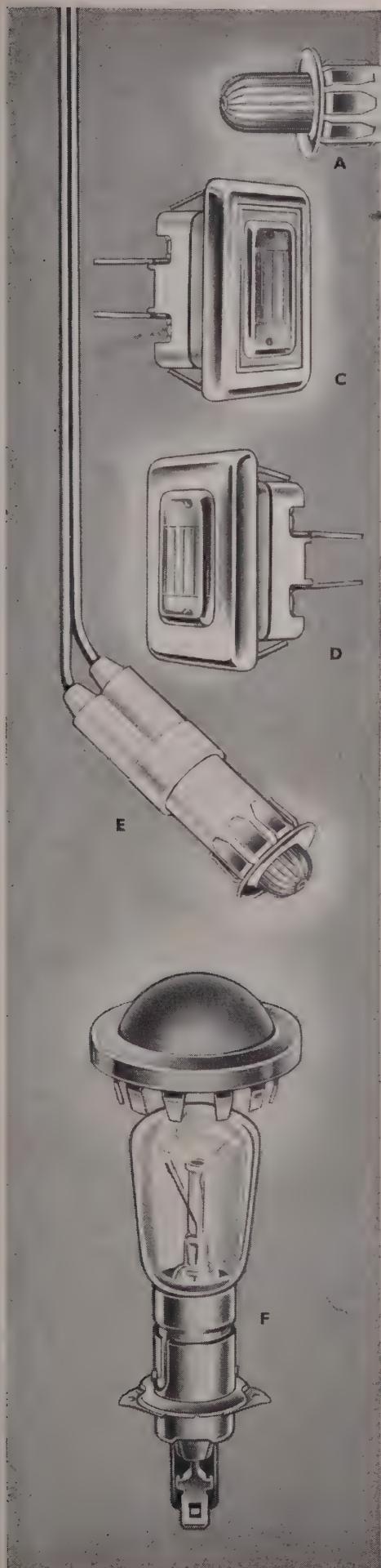


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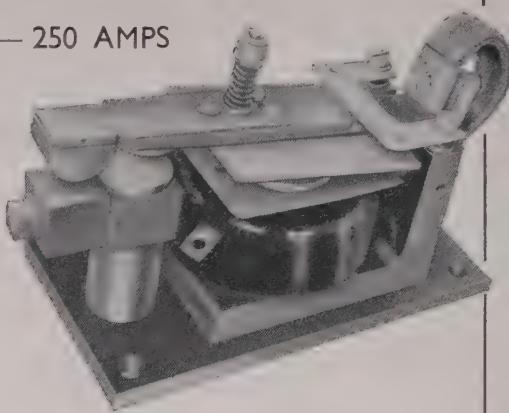
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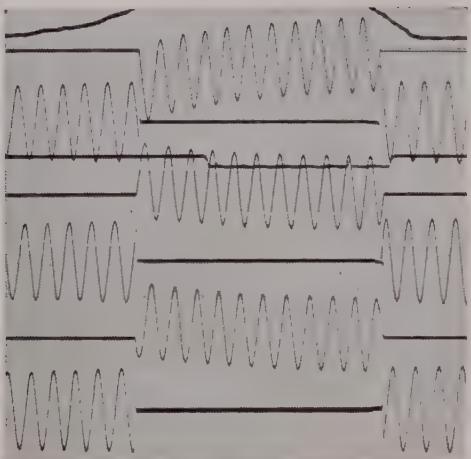
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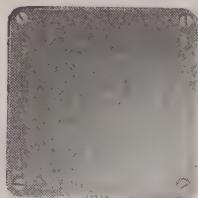
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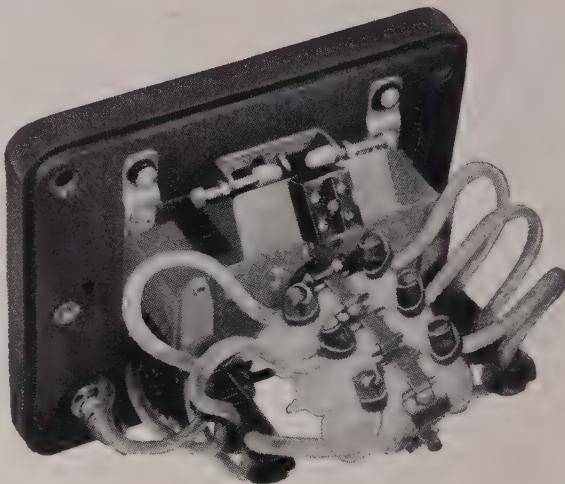
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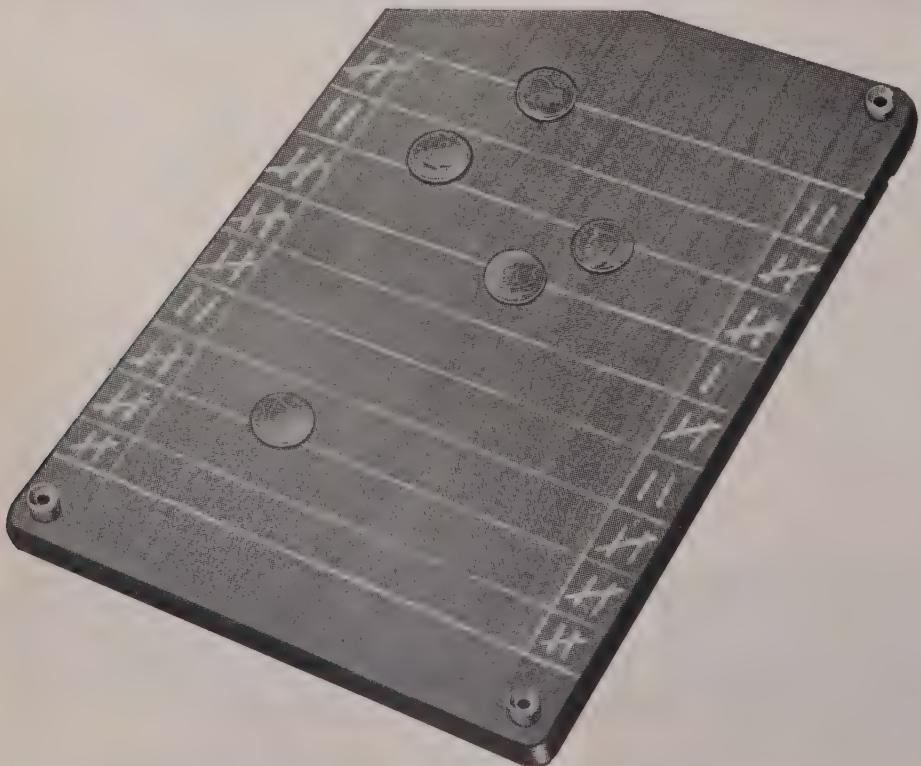


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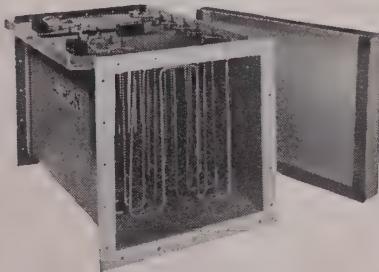
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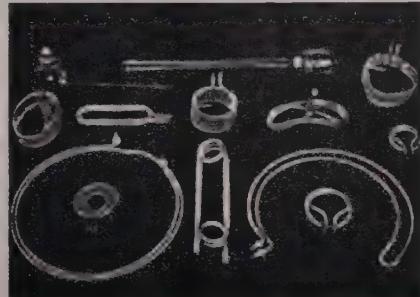


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The author has consolidated the fundamental phenomena underlying both the transistor and semi-conductor devices into one treatment. In addition he has brought together electronics and basic network theory and has emphasized the standard methods that prevail once an electronic device is reduced to a linear active circuit; the treatment generally is qualitative and emphasis is given to the basic properties of an analytic method or process. 60/- net.

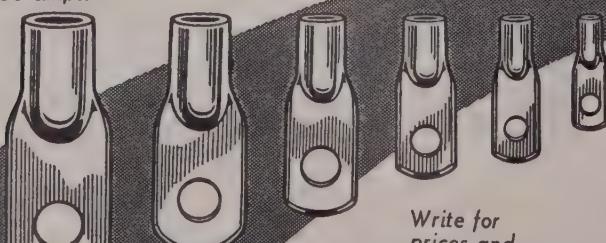
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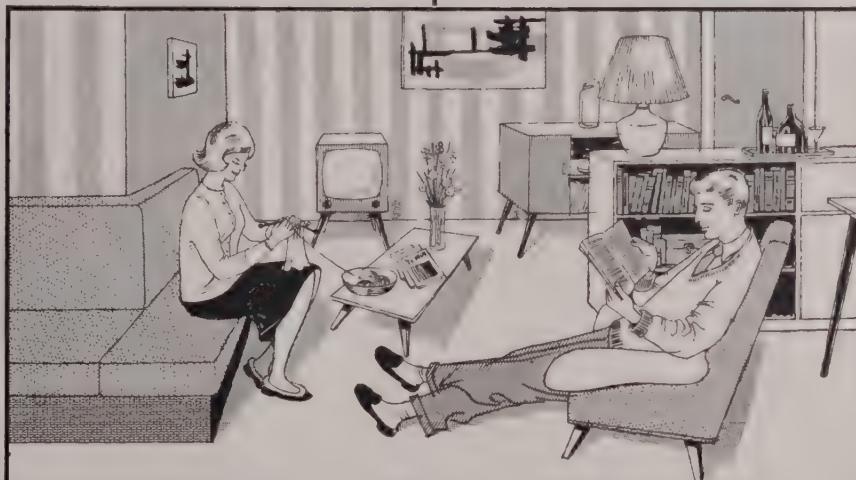
# HORSTMANN TIME SWITCHES



*automatically control*

## SPACE HEATING\*

## OFF PEAK TARIFFS



## \* SPACE HEATING

## NEON SIGNS

## SHOP WINDOW LIGHTING

## IMMERSION HEATERS

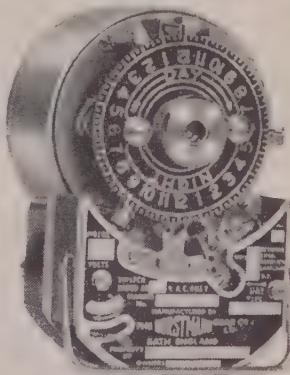
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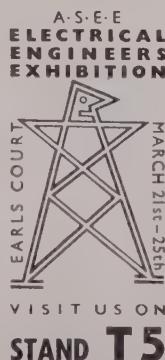
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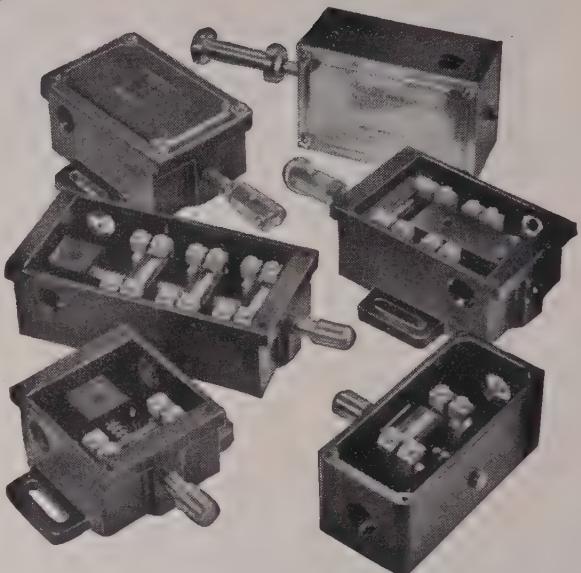
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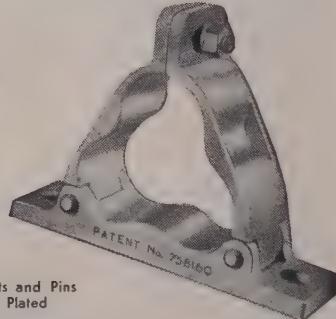
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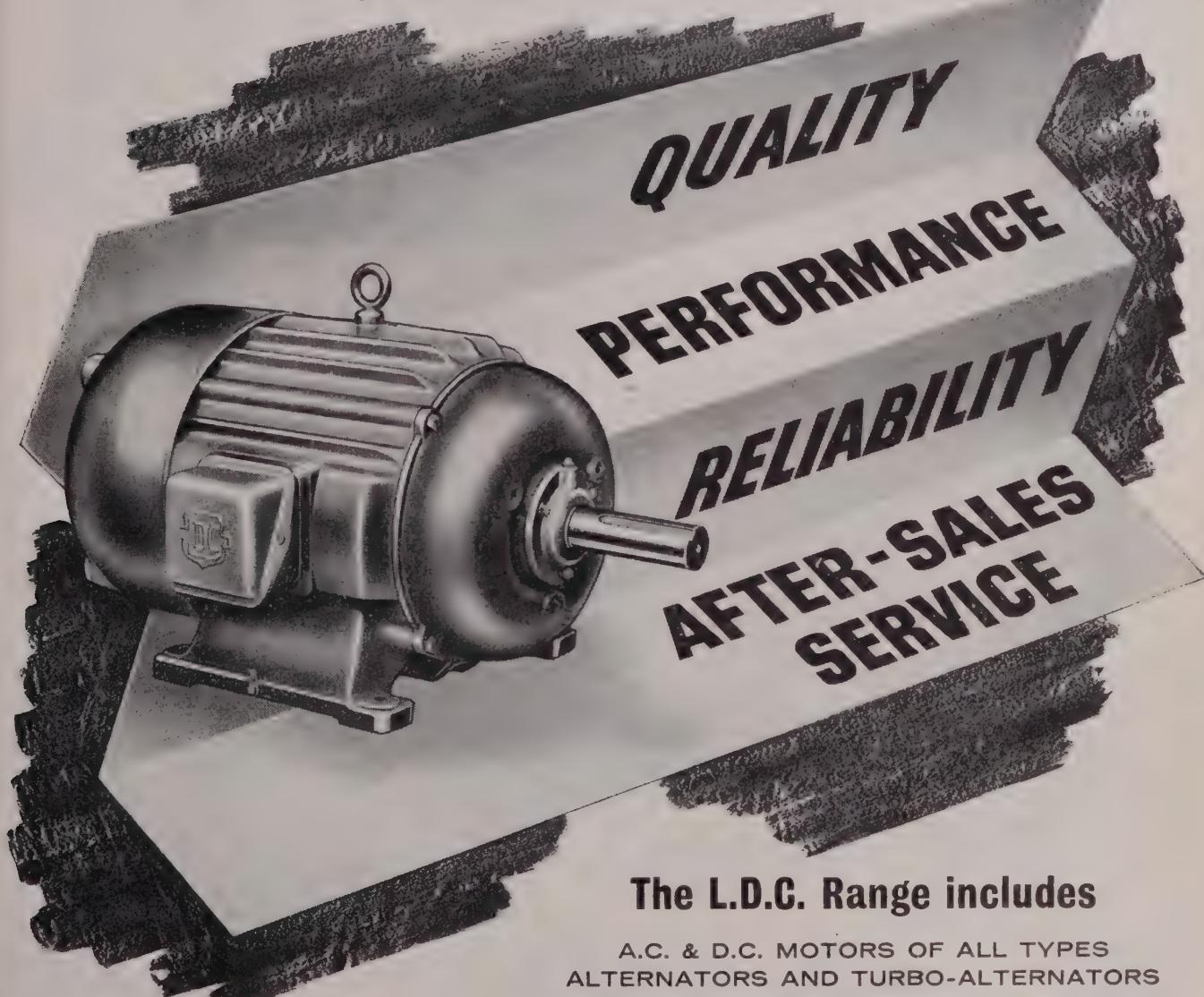


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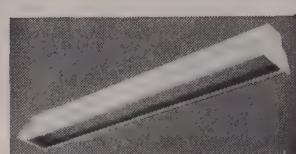
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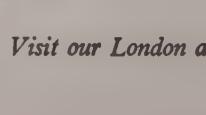
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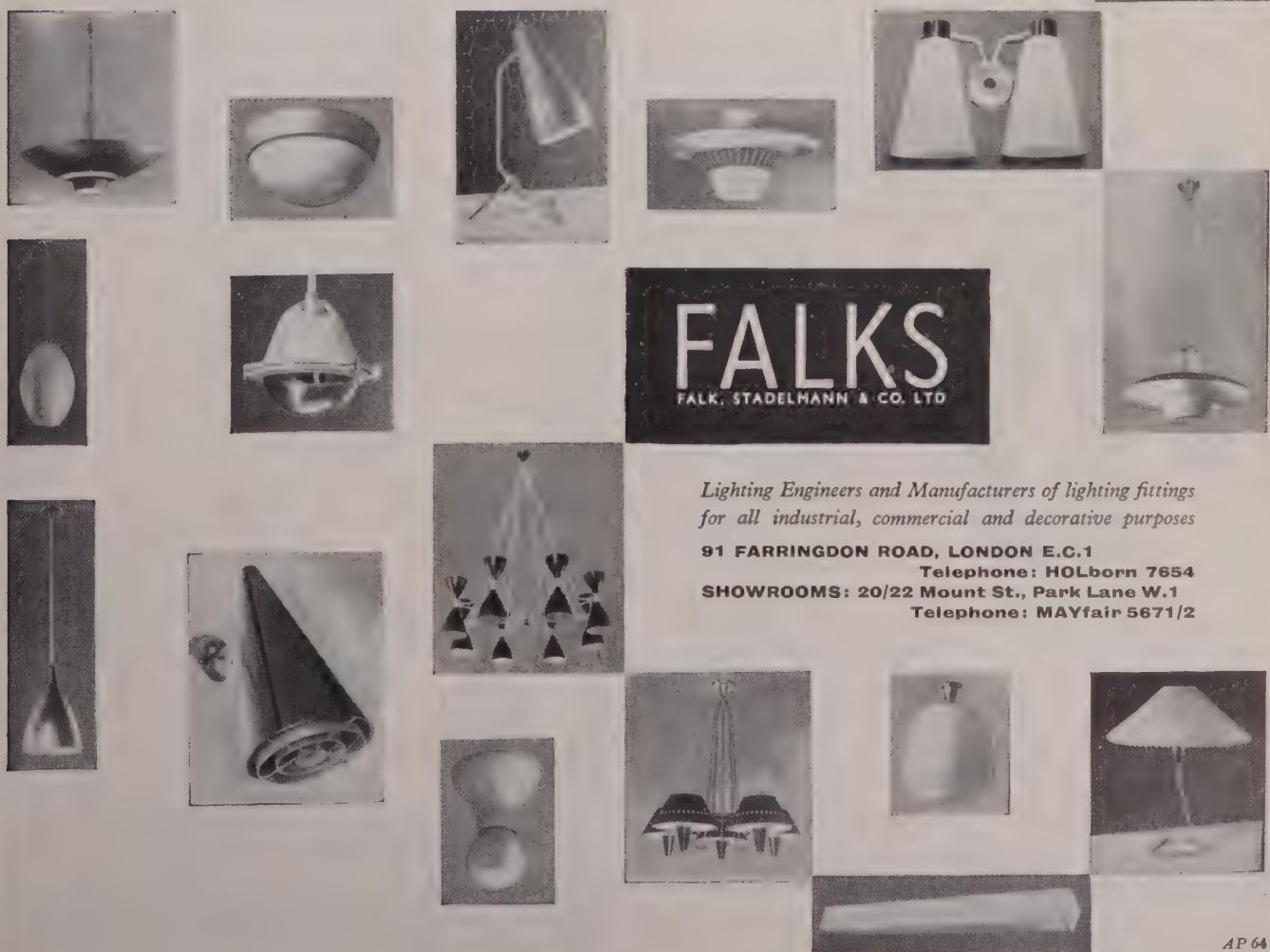
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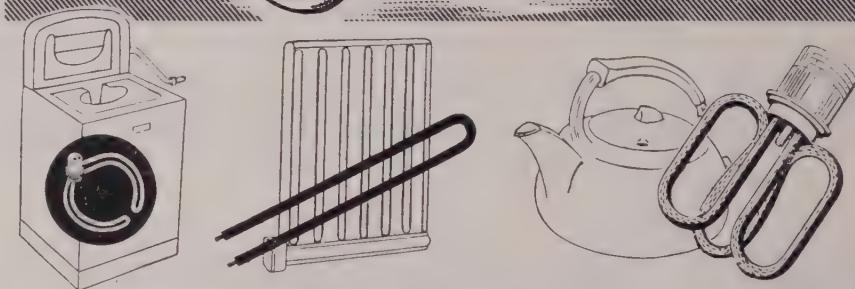
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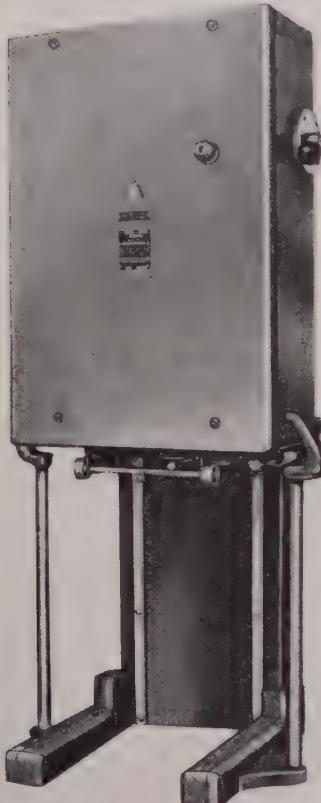
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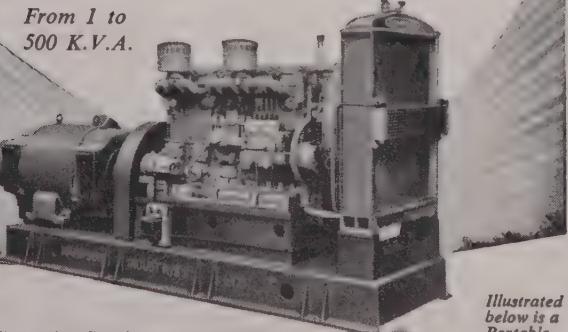


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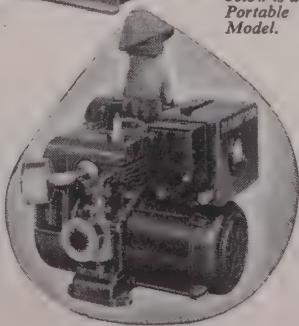


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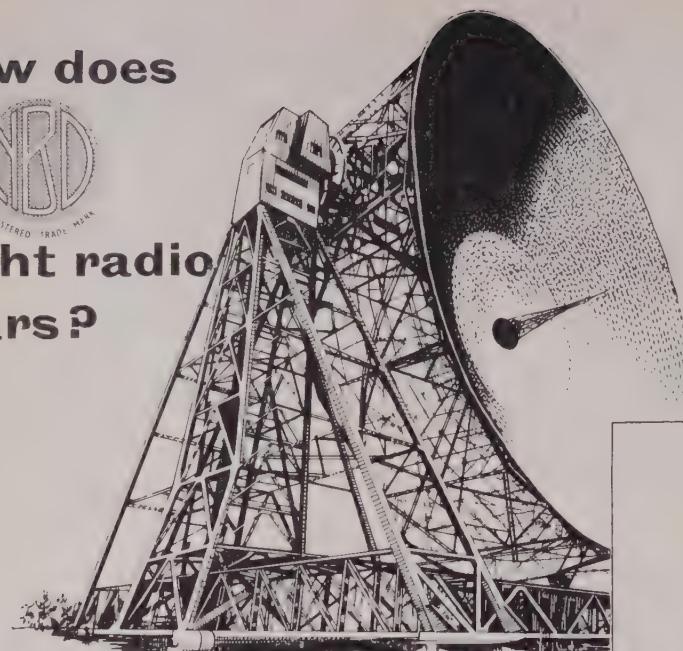
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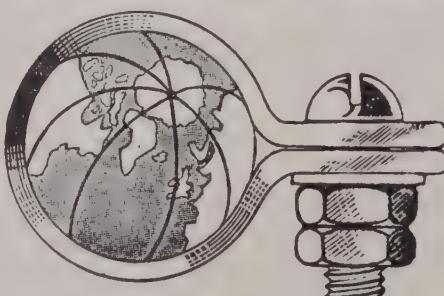
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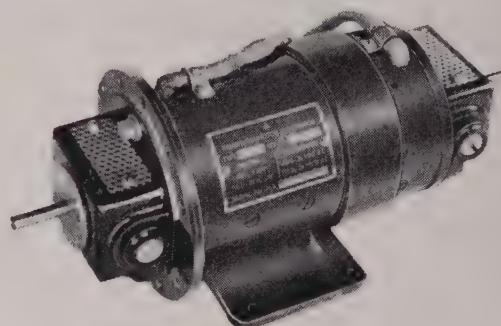
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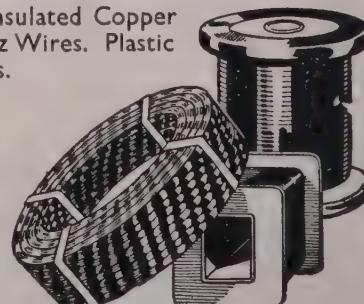
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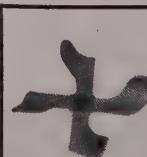
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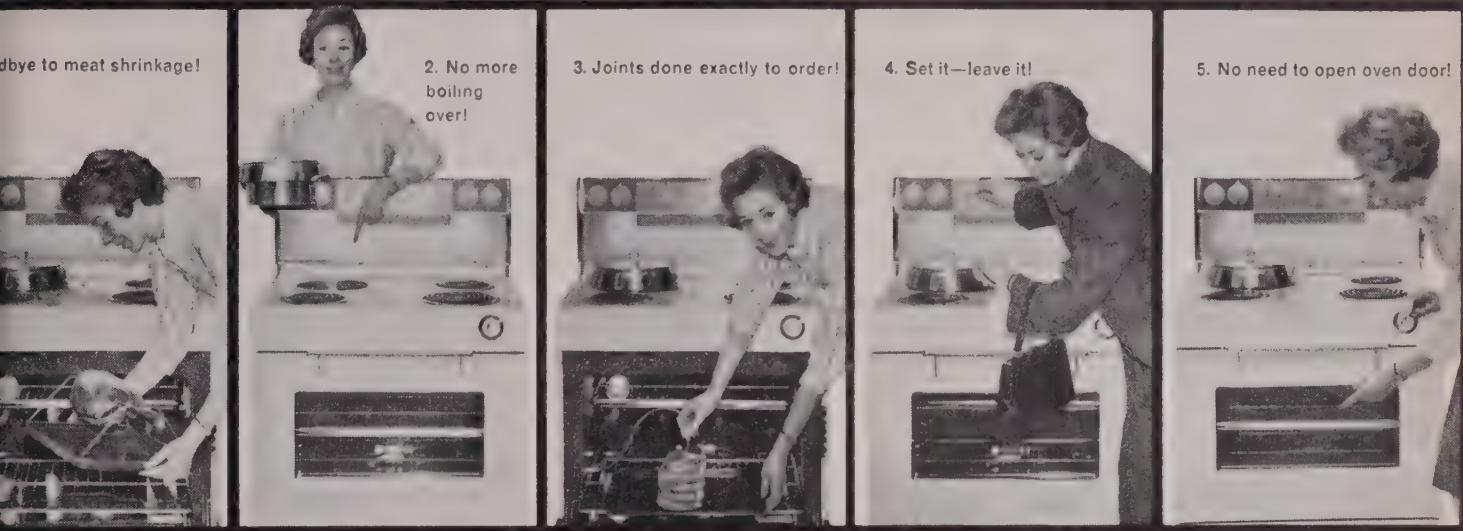


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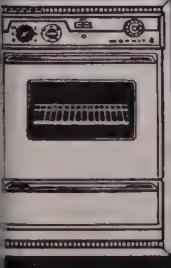
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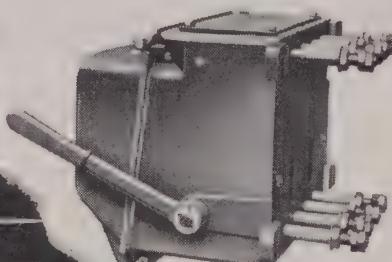
DENNIS  
TYPE 'H'

### FRONT CONNECTED PATTERN SWITCHES

The normal standard type is known as the front connected pattern and is for use as a loose unit or for mounting above or below ducts or busbar Chambers. The catalogue prefix is "CH" or "CS" according to whether the switch is fused or not.



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CH320N/B

This pattern is the standard switch provided with insulated screwed stems protruding through the back of the switch complete with locknuts. This type is for mounting on the front of cubicles so that connections of either cable or solid copper can be made to the back of the switch inside the cubicle. The catalogue prefix is CH-/B or CS-/B.

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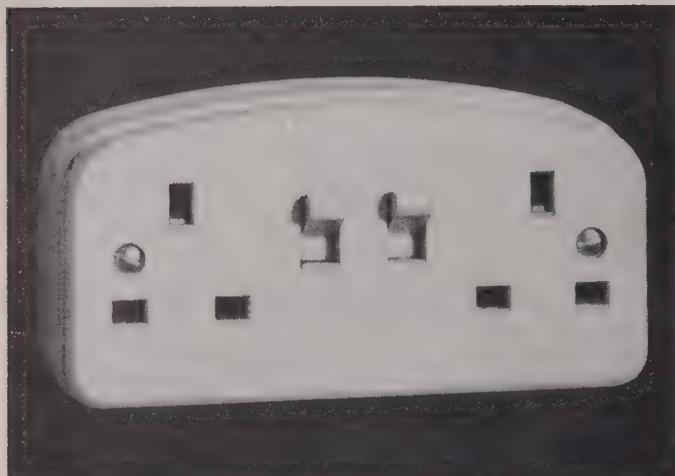
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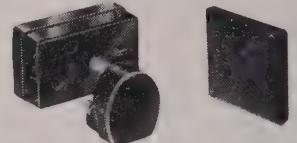
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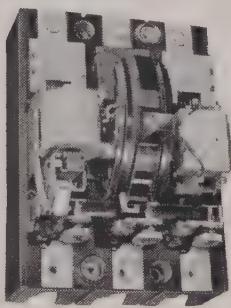
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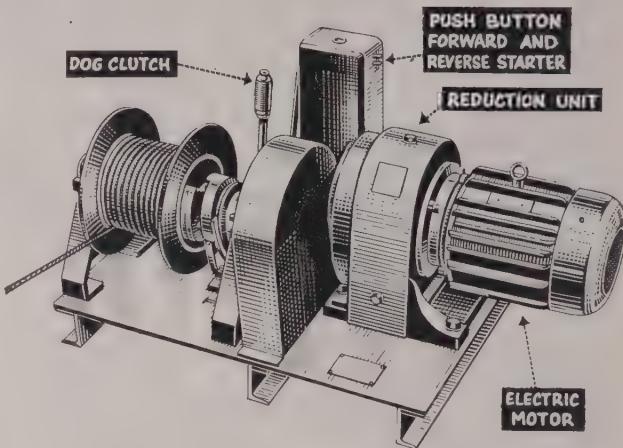
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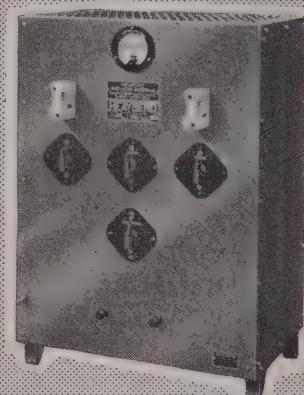
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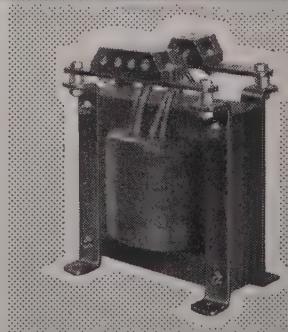


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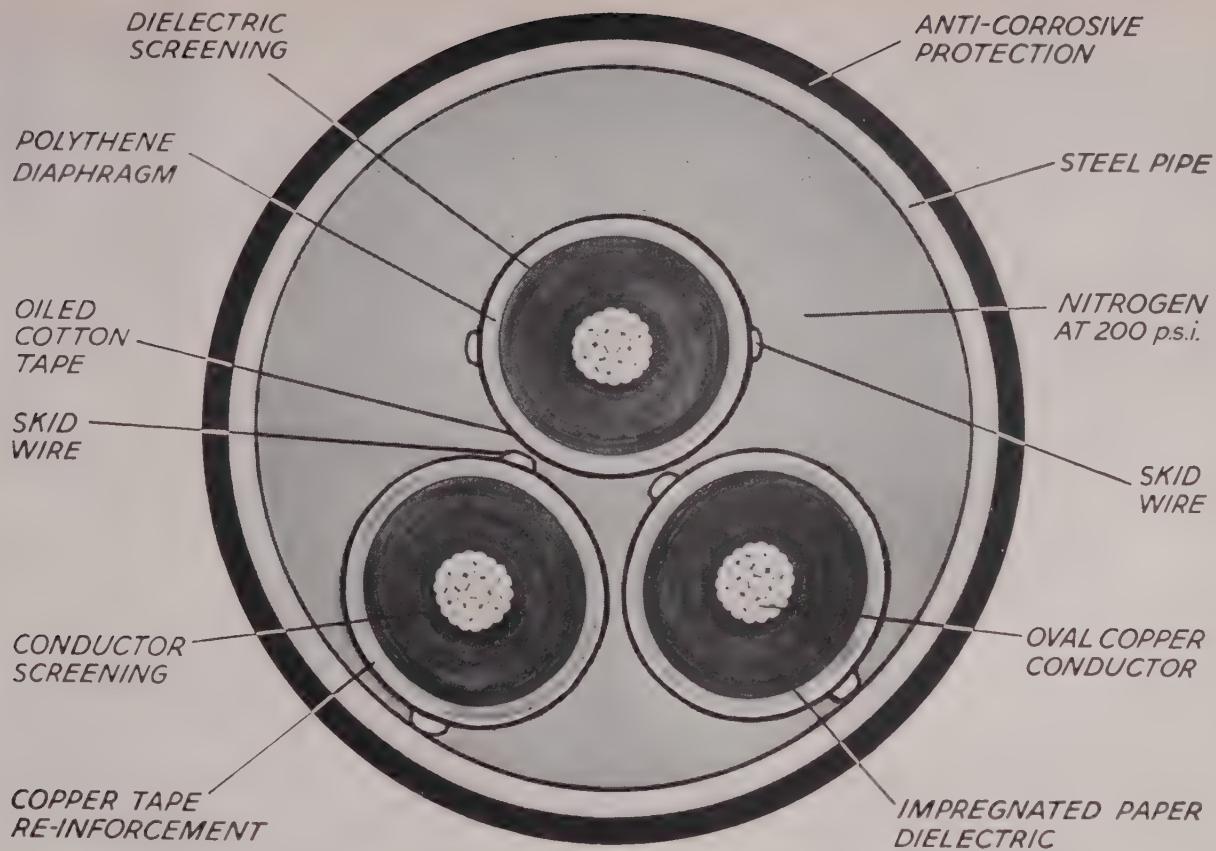
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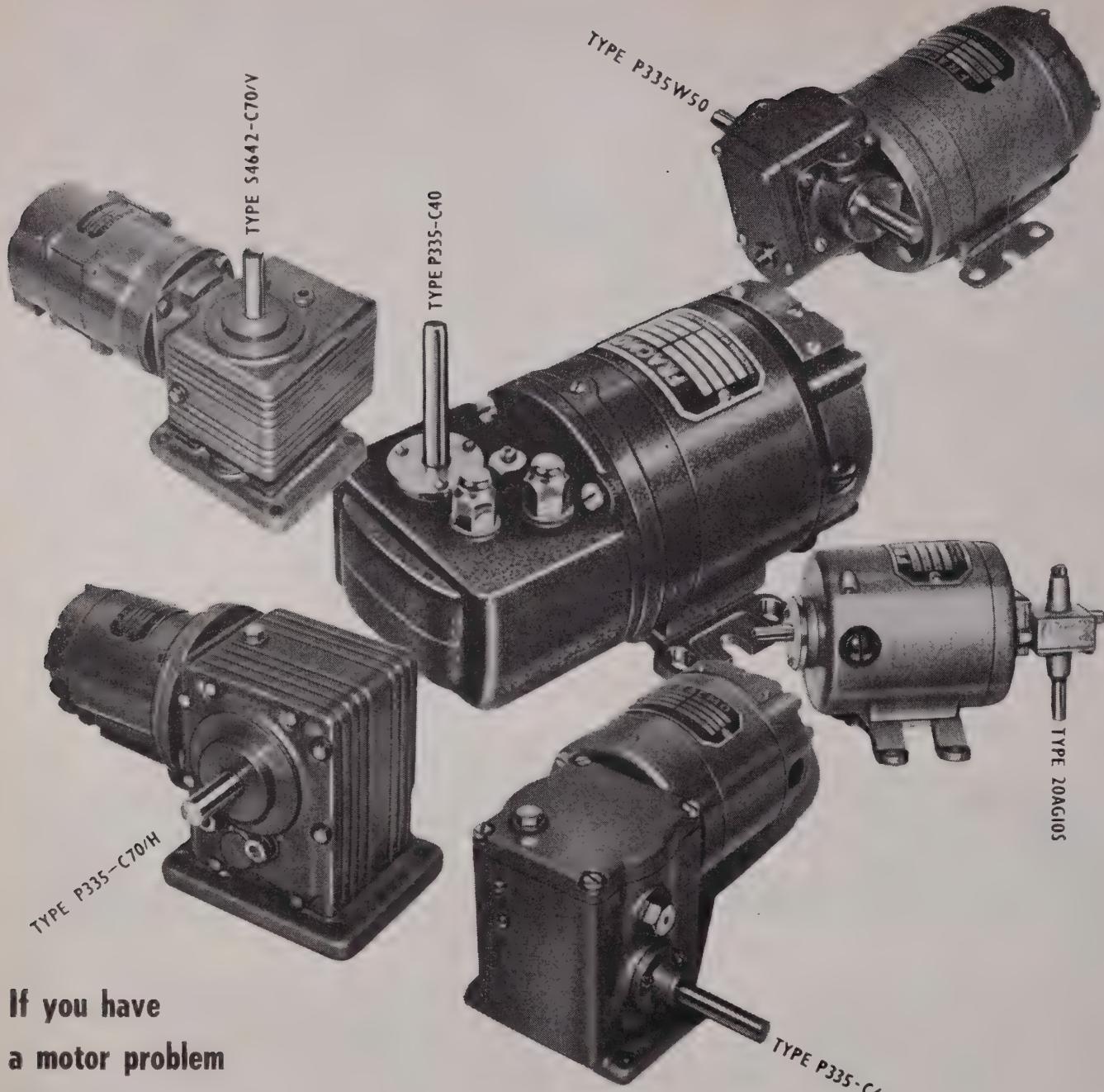
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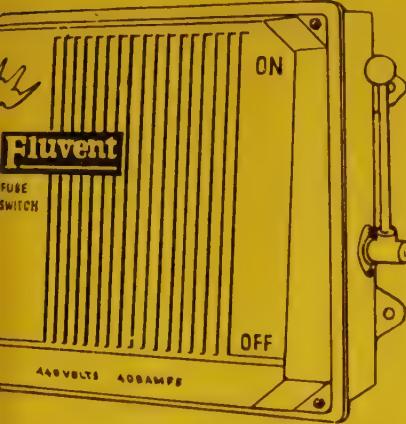


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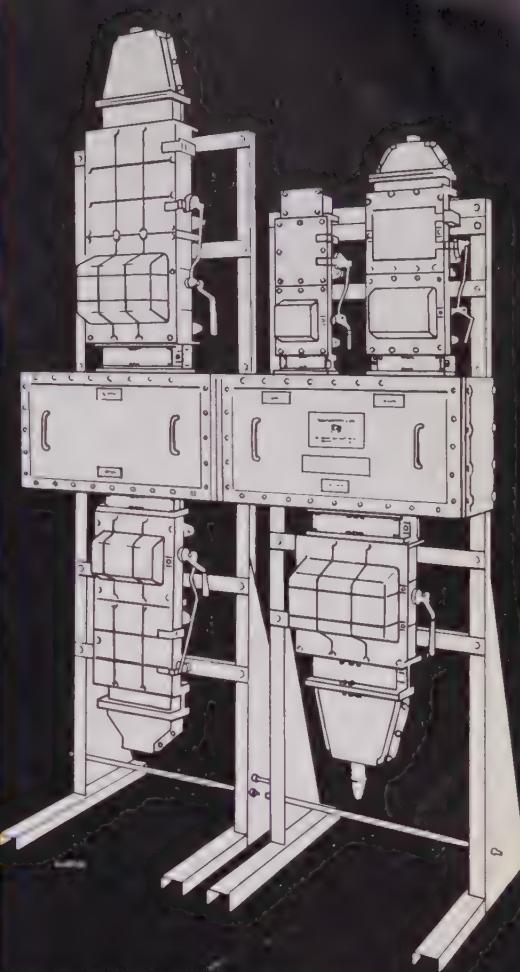
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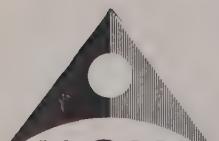
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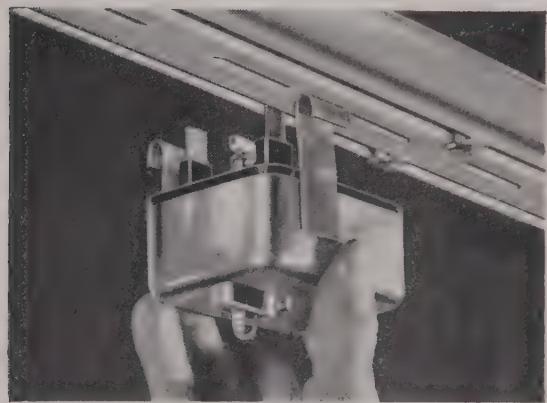
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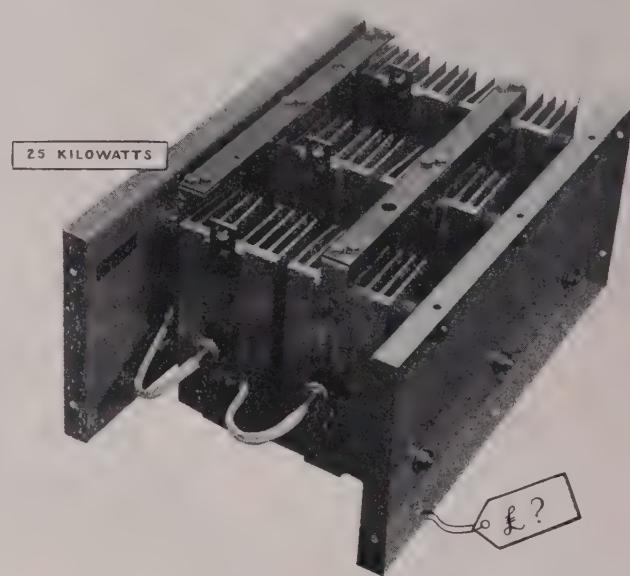
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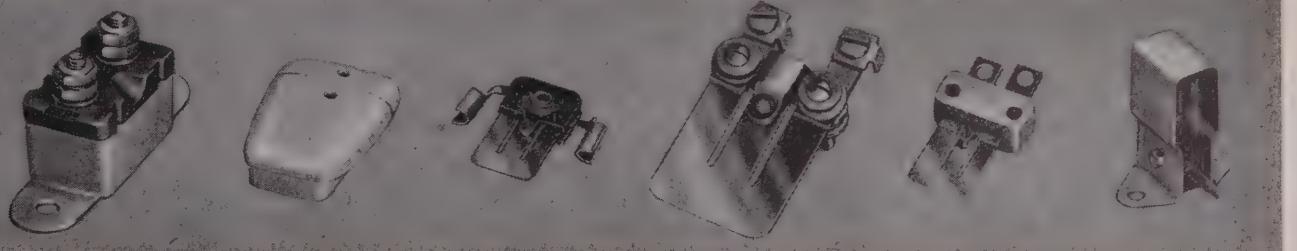
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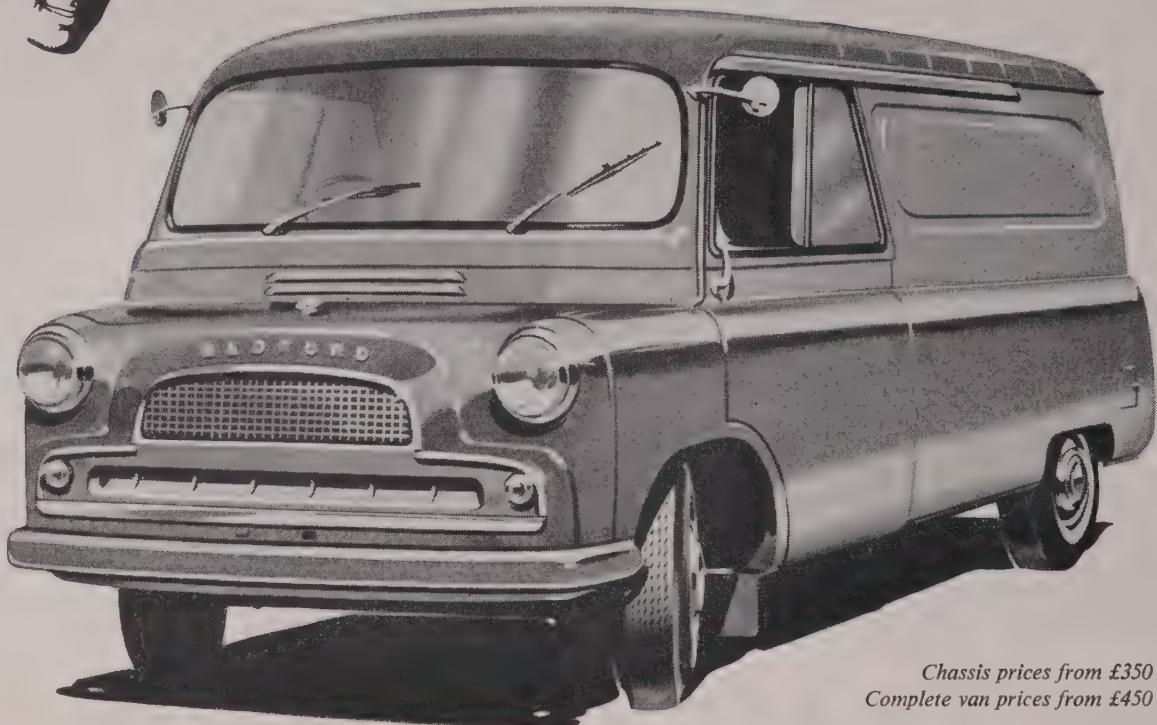
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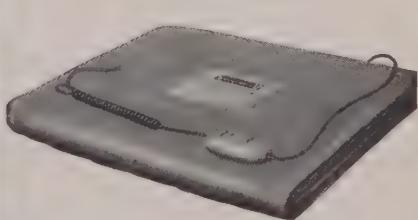
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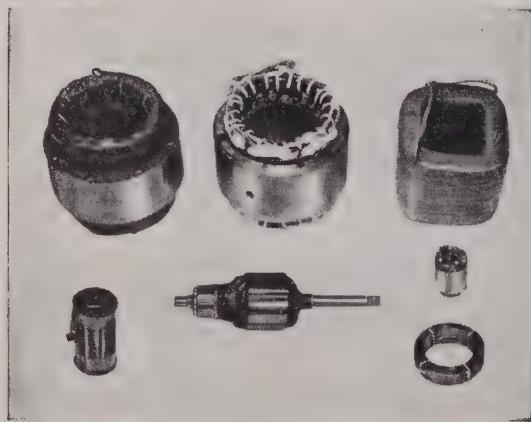
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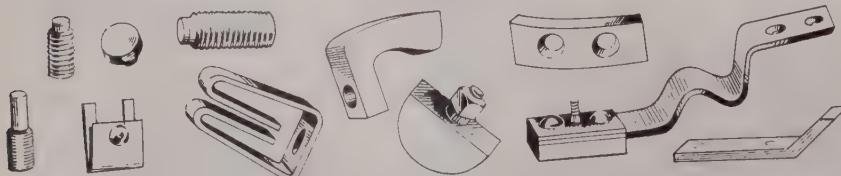


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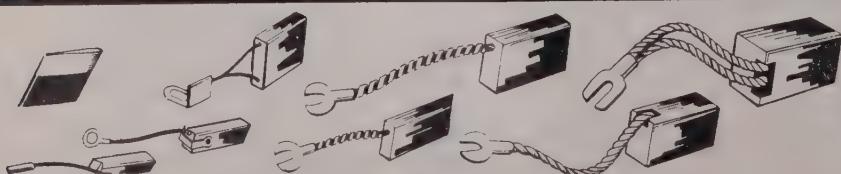
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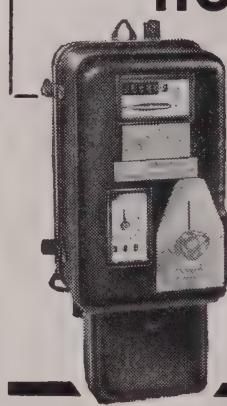
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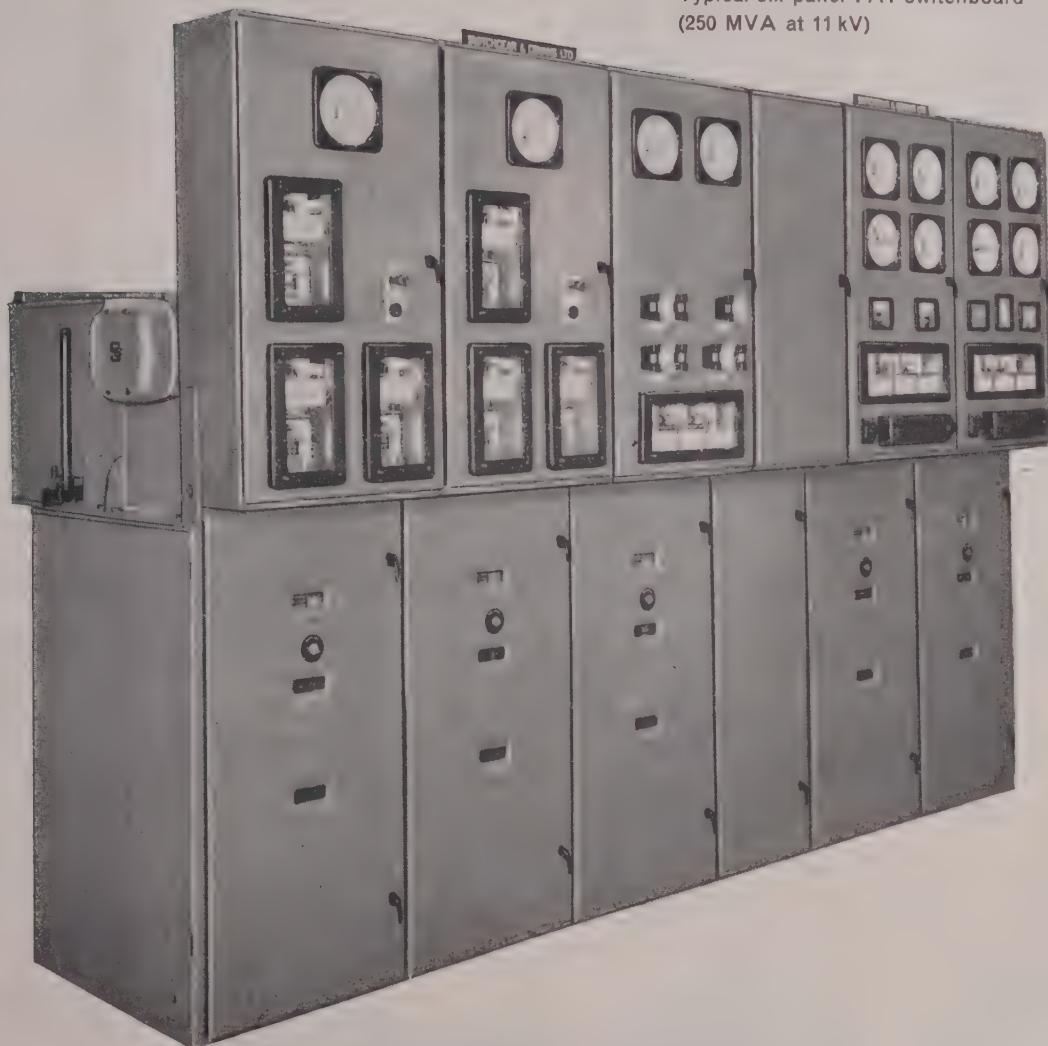


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'Colour blended' glass fascia. Three radiant plates. Complete simmer control. Independent grill. Removable oven roof and side panels. Inner glass door. White or Ivory, 44 gns. Auto-timer optional, 5 gns. Tricity Auto-spit optional, 5 gns.

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An exceptionally well established cooker with an assured market. Radiant plate, grill boiler, roomy oven, etc. . . . all the advantages of electric cooking on a 13 amp plug. £26.15.0d.

In 1960 TRICITY was the top selling name in electric cookers . . . the new 1961 range shows all the signs of repeating this success with superb new styling, new features and new price appeal, which keep the 'Marquis' and 'Viscount' well out in front for value-for-money and high-speed cooking simplicity.

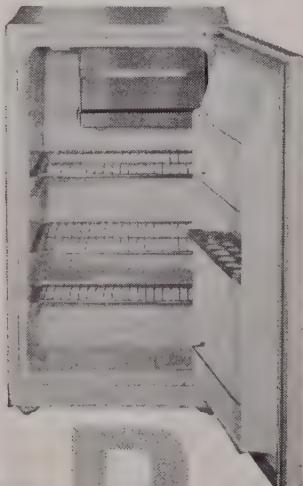
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And NOW . . . the magnificent new Tricity family of refrigerators, with their own unique features and sales appeal. More than any other range Tricity let you cater for homes of every kind and every size.

**TRICITY KITCHEN-COLD JUNIOR**

3.4 cubic ft. capacity with exceptional freezer space, adjustable shelf positions, well planned door storage. White or Ivory, 48 gns.

**TRICITY DINER-COLD**

4.5 cubic ft. capacity. The refrigerator for dining room, hall or lounge, finished in magnificent sapele veneers. 3.4 capacity, Diner-Cold Junior also available. Diner-Cold 69 gns. Diner-Cold Junior 57 gns.

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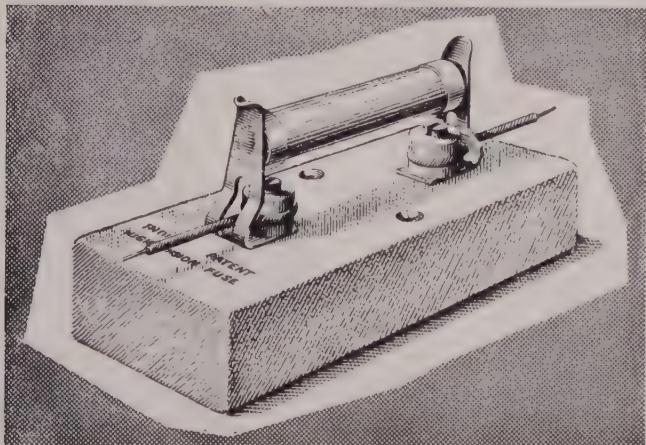
# Fuse for thought-



1893



1961



## BRUSH CARTRIDGE FUSE-LINKS—

The H.T. fuse above, was invented by a Mr. Mordy and introduced by The Brush Company in 1893. Since that time, as distribution systems expanded, the problem of providing fault protection at low voltage has involved designing a more ingenious device! To-day, high breaking Capacity Fuse-Links by Brush incorporate these advantages:

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\* Deterioration of the fuse element is prevented by complete enclosure.

\* There is no external arc or disturbance during operation and arc voltage rise is restricted.

\* They are compact and inexpensive and may be used to give protection to existing equipment of low breaking capacity, thus avoiding costly replacement.

\* They are accurately calibrated and give reliable discrimination between themselves and with other protective devices.

Brush CARTRIDGE FUSE-LINKS for Industry 2—800 amperes

Inter-service- $\frac{1}{4}$  ampere-150 amperes. House Service Cut-out 5-100 amperes. The full range A.S.T.A. Certified to BS 88, 1952

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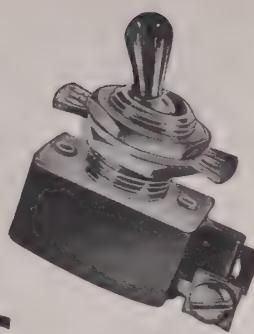
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## Switches

## Neon Signal Lamps



G.600

### S.L.160, S.L.162 and S.L.163

New miniature low cost Neon Signal Lamps.

$\frac{1}{2}$ " hole fixing. All completely waterproof.

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**C.S.200:** 15-AMP Rotary Cooker Switch.

Double pole three "heat" and "off."

**S.L.50:** Neon Signal Lamp with snap-in fixing.

**M.30:** 10-AMP Toggle Switch.

**A.55:** Refrigerator Door Switch.

**S.254:** A.C. only 10-amp Toggle Switch, double pole.

**S.250:** A single pole version of the S.254.

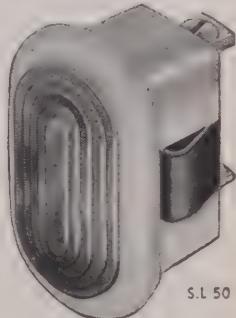
**G.600:** 3-AMP Toggle Switch.



S.L.160



S.L.162



S.L.50

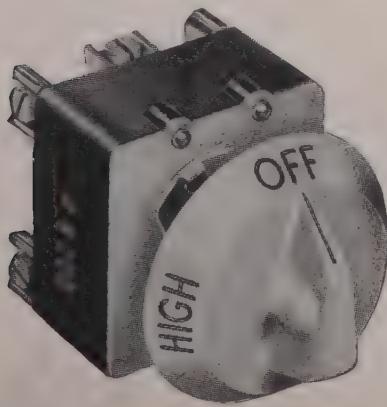


A.55

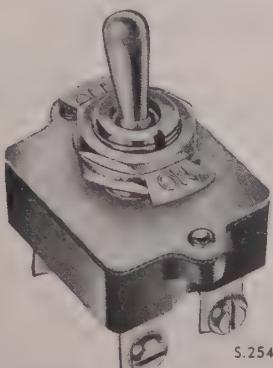
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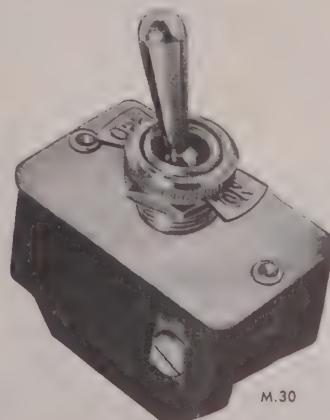
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C.S.200

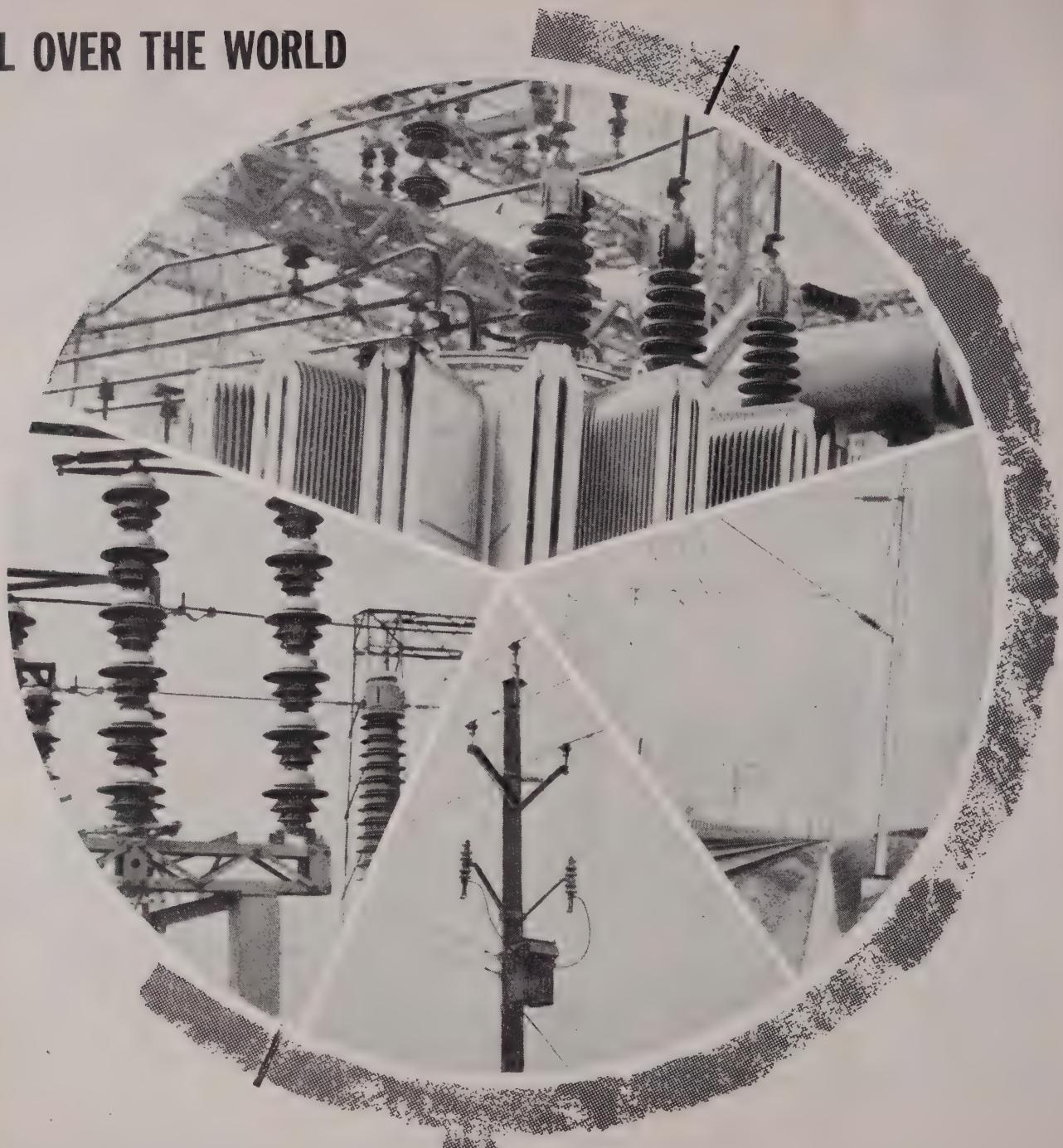


S.254



M.30

# ALL OVER THE WORLD



**OVER-HEAD, UNDER-RAIL**

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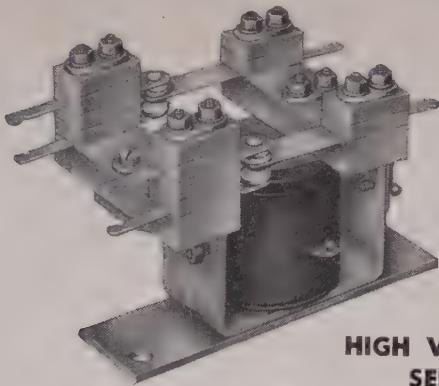
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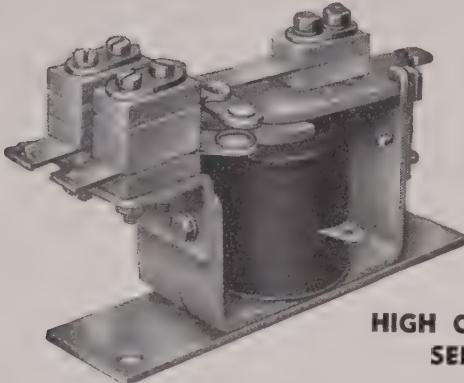
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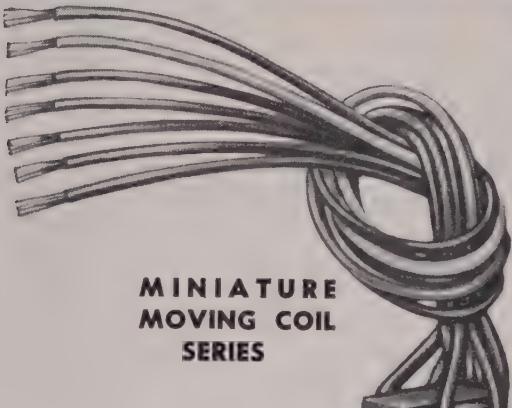




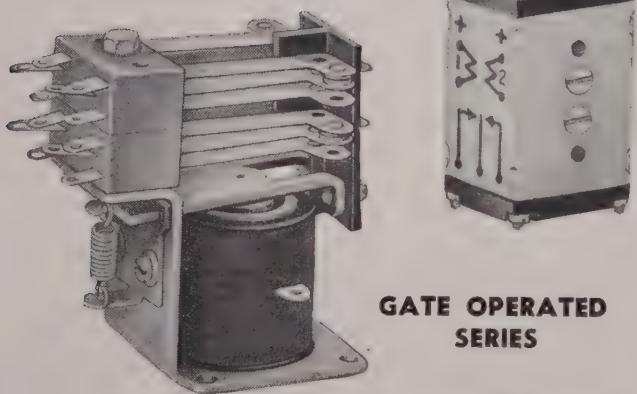
HIGH VOLTAGE  
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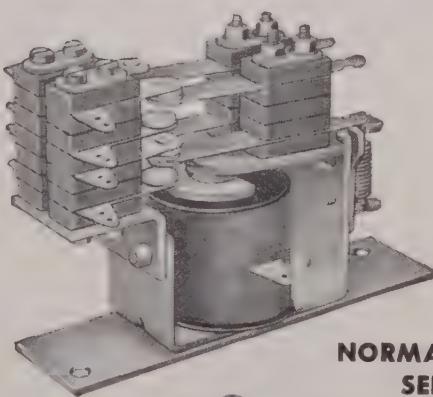
HIGH CURRENT  
SERIES



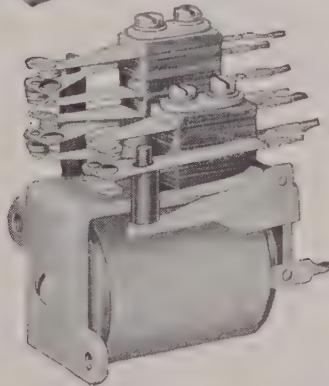
MINIATURE  
MOVING COIL  
SERIES



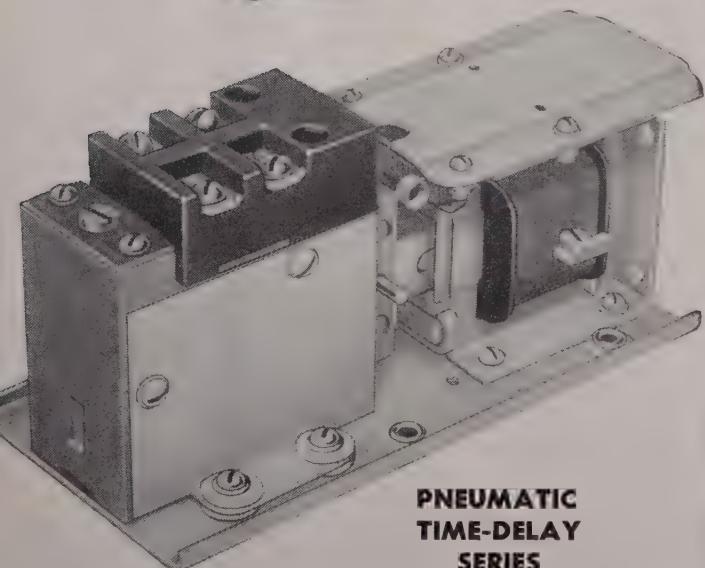
GATE OPERATED  
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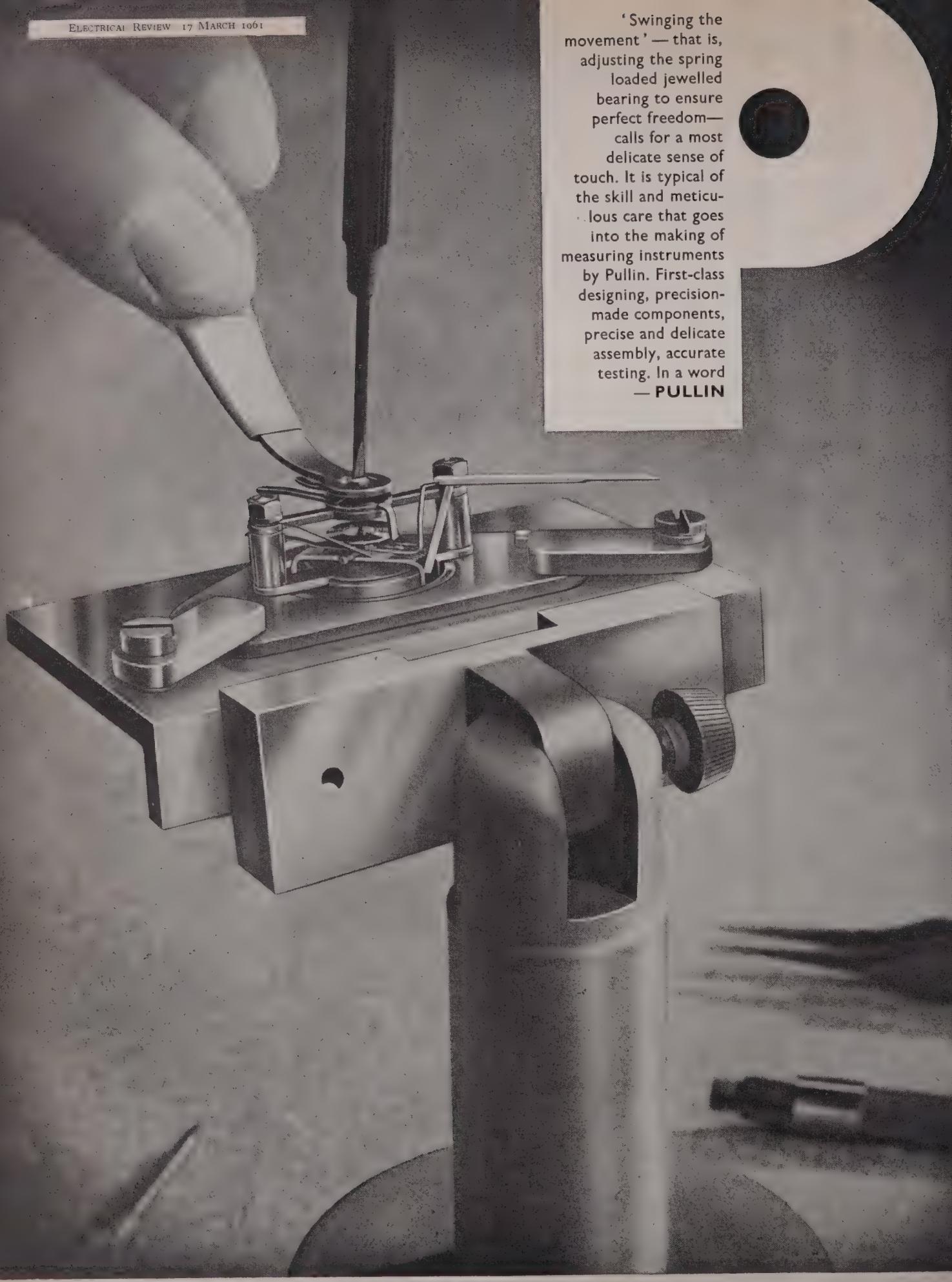
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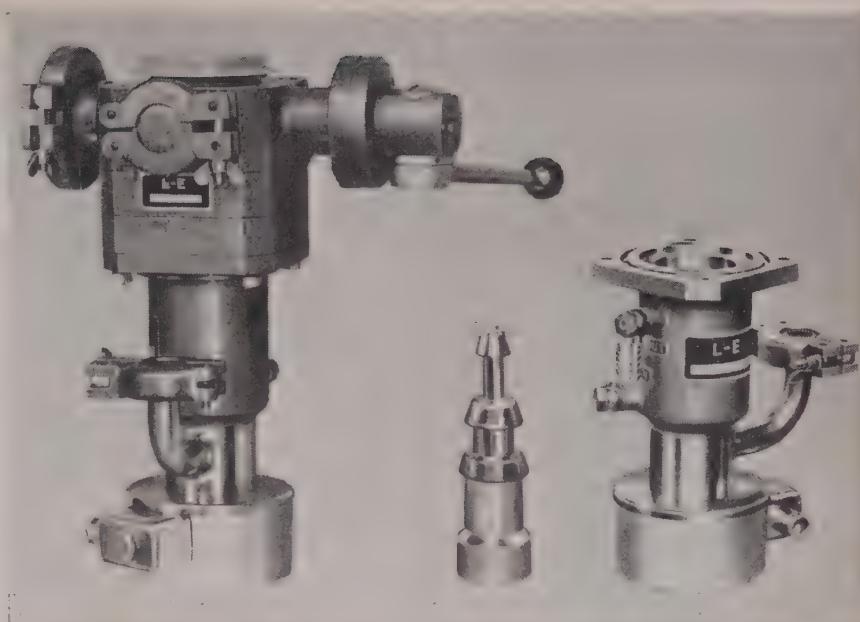
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system for  
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**STAND D.3, A.S.E.E.**

**Matchbox Millions**  
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This magnificent export achievement shows what can be accomplished by British design and salesmanship when allied to the most modern production methods. Lesney Products & Co. Ltd. are one of many manufacturers who realise the great advantages of BARDUCT. The Barduct system is specially designed for distributing electrical power to individually driven machines. Connection being made by means of fused plug-in tappings, rated at 20, 30, 60, or 100 amps.

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# STOP PRESS !!

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- ★ Double plug-in feature available
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- ★ Simple installation
- ★ Ex-Stock Delivery

## Telcon Bimetal for temperature indication

Table giving the properties of the more important types of Telcon Thermostatic Bimetals.

Type	Strip + Deflection Constant	Electrical resistivity Microhm-cm at 20°C	Range of max. Sensitivity °C	Useful deflection Range °C	Stabilising Heat Treatment Temp. °C for one hour
140	14.0 x 10 <sup>-6</sup>	76	20-200	-70-350	350
400	12.0 x 10 <sup>-6</sup>	70	70-300	-70-400	350
15	9.5 x 10 <sup>-6</sup>	16.7	20-120	-70-220	350
75	6.8 x 10 <sup>-6</sup>	57	150-300	-70-500	350
38	3.8 x 10 <sup>-6</sup>	56	20-250	-70-500	350
188	9.0 x 10 <sup>-6</sup>	93	10-150	-70-500	350
131	13.3 x 10 <sup>-6</sup>	18	10-120	-75-150	175
11	8.4 x 10 <sup>-6</sup>	20	10-150	-70-350	350

The deflection constant (d) is defined as the deflection of a strip of unit length and unit thickness for each °C rise in temperature over the linear part of the deflection curve.

All types of Bimetal shown in the table are manufactured in strip form down to 0.005 in. thick, in widths not greater than 5 in. They can also be supplied down to 0.0025 in. thick with a maximum strip width of 2 in. Cut strips are also supplied. Materials can be suitably etched to indicate the high or low expansion sides, as requested.

enquiries to: **TELCON METALS LTD.**

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Registered Trade Mark

## Miniature Circuit-Breakers

Pre-tested and guaranteed

★ Used the World over

**ASEE — STAND F.1**

## The M.C.B. Co. (Manchester) Limited

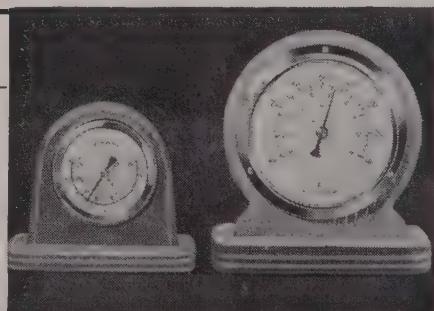
Specialists in Miniature Circuit-Breakers

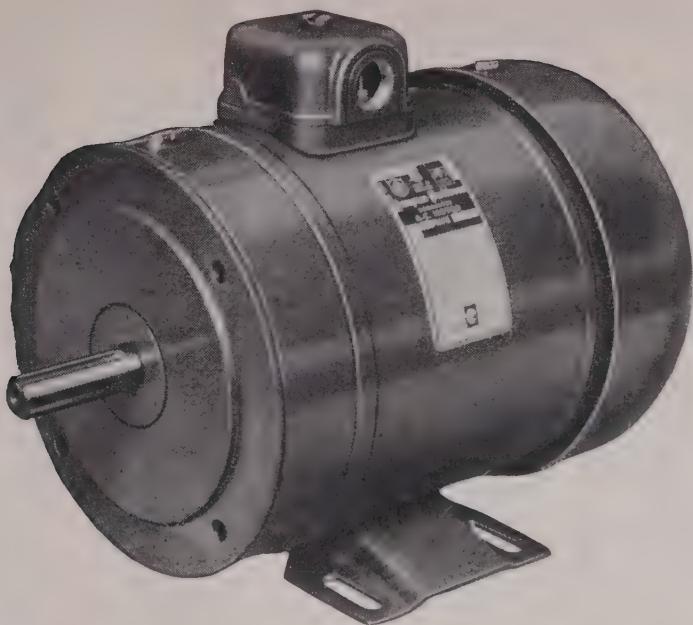
LUPUS WORKS • OXFORD ROAD • ALTRINCHAM • CHESHIRE  
Telephone : Altrincham 2722/3

Telcon Bimetals are widely employed in many types of thermometers, typical examples of which are manufactured by Regwell Limited and illustrated below.

Thermostatic Bimetals consist of two layers of alloys bonded together at their interface and having different coefficients of linear expansion. When subjected to temperature change, the strips will deflect or spirals will rotate to give an indication of temperature.

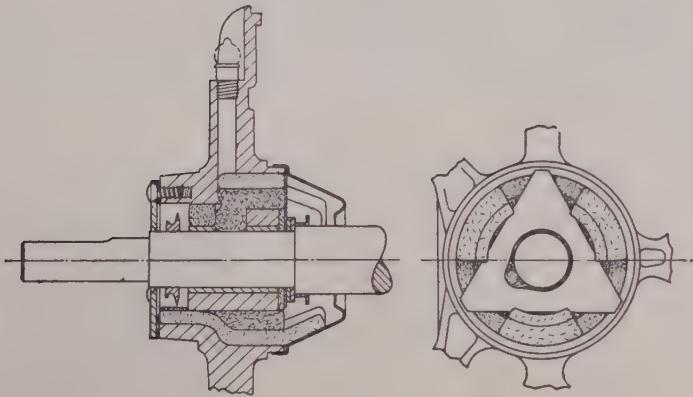
Bimetal elements are ideal for use in the manufacture of thermometers, control elements for air conditioners, ventilators, water mixers, valves, driers, ovens, domestic irons, immersion heaters, radiators, thermostats, fire alarms etc.





Most industrial motors today have ball or roller bearings; they were, in fact, standardised on C.P. motors at a time when most other manufacturers still fitted sleeve bearings. We fitted them because we realised early on that they can survive long periods without maintenance. But, on the other hand, they are noisier than good sleeve bearings properly lubricated and, in many of the places in which our F.H.P. motors are used, silence is important. What was wanted, then, was a sleeve bearing that would work with as little maintenance as a ball race. We developed the original Marathon sleeve bearing, which was quite outstanding in this respect, many years ago, and our Marathon Mark III is the result of even further improvements to that design.

## This thing called know-how



This bearing is an excellent example of that part of engineering design that stems from experience rather than theory and is covered by the possibly ugly but certainly indispensable term—know-how. The oil cavity is large and filled with highly absorbent felt which, acting as a wick, circulates the oil continuously, and which also acts as an oil filter. The thrust is taken on a bakelised washer supported by a steel washer, bearing on a triangular plate of spring steel which cushions the end thrust. The thrust faces are lubricated by the felt projecting through a D-shaped opening in this plate. These bearings run silently without attention for a year or more at a time.

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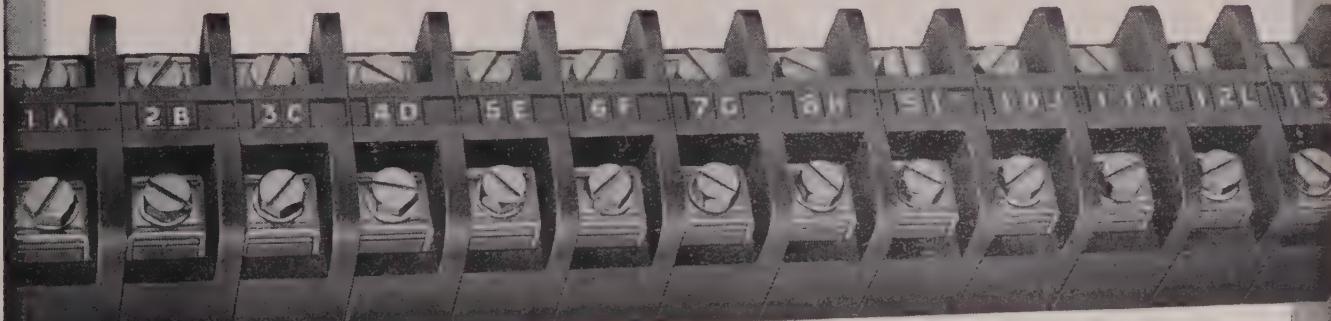
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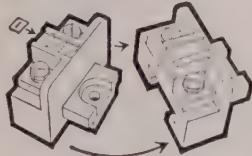


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See Multi-Lock for yourself on Stand K2 at the Electrical Engineers Exhibition, Earls Court, March 21-25

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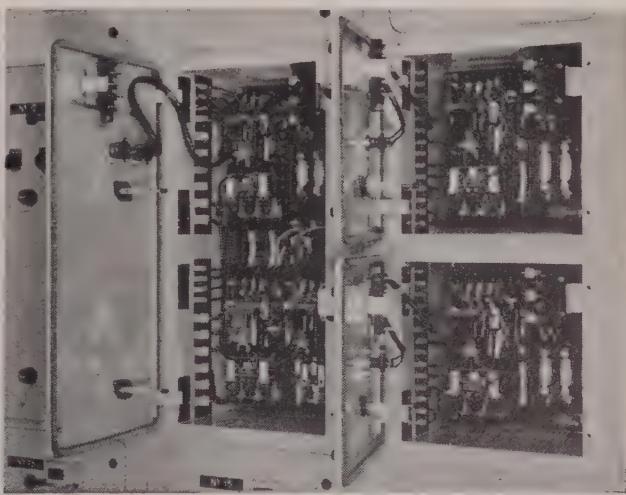
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(Continued on page 204)

(Continued from page 203)

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(Continued on page 205)

(Continued from page 204)

**HIGGINS & CATTLE LTD.****322 India Buildings, Water Street, Liverpool 2**

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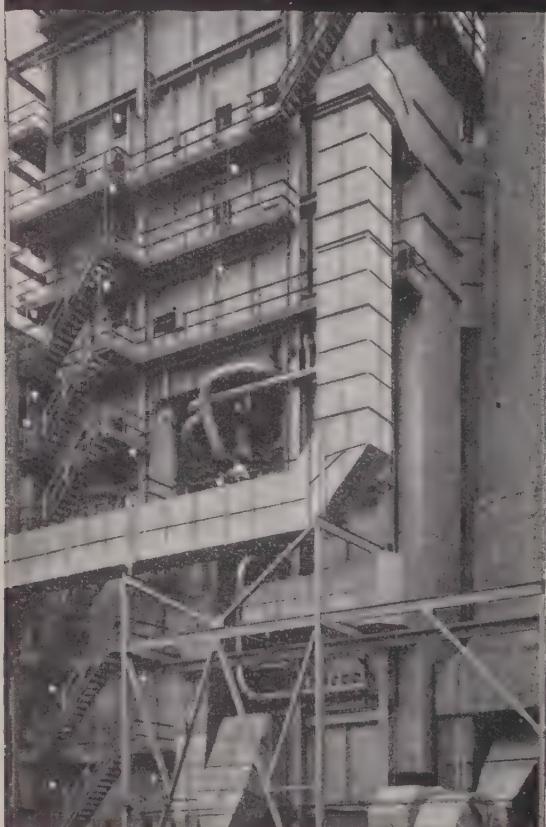
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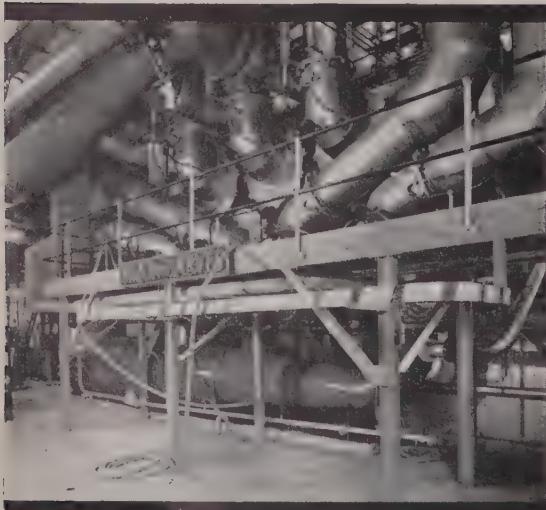
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*left.* The operating front of the boiler is housed in the turbine building. Fuel can be blast furnace gas or fuel oil or a mixture of both.

*right.* The central control panel. From here, both the boiler and the high pressure turbines are controlled.



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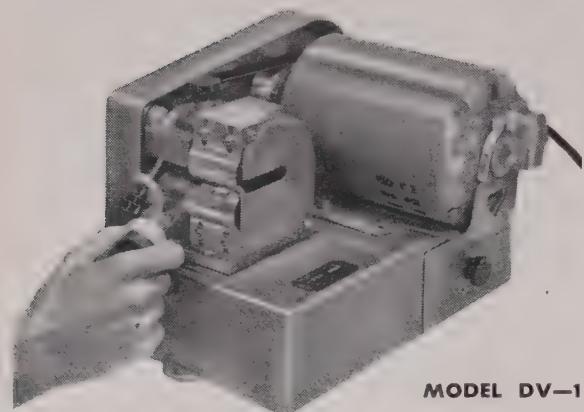
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The nylon faces, which are turned from a special grade of nylon rod, screw into a machined steel head, and can be fitted or replaced by hand in a few seconds. They are made with a shoulder for increased strength and serrations to prevent loosening in use. This super quality nylon gives a firm but resilient blow that does not mar the work, is extremely durable, and will not crack or chip. THOREX is the best "soft" hammer THOR has produced in 25 years, and Works and Production Managers, Buyers and Senior Staff are invited to write for a free test sample and further particulars.

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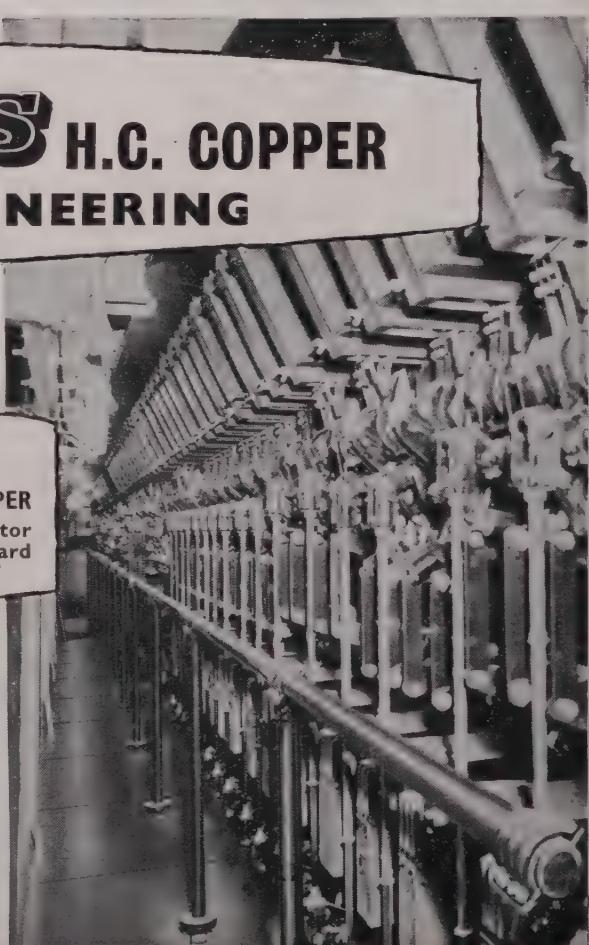
Photograph by kind permission of Vickers-Armstrongs (Shipbuilders) Ltd.

**STAND C 8 AT THE ELECTRICAL ENGINEERS (A.S.E.E.) EXHIBITION**



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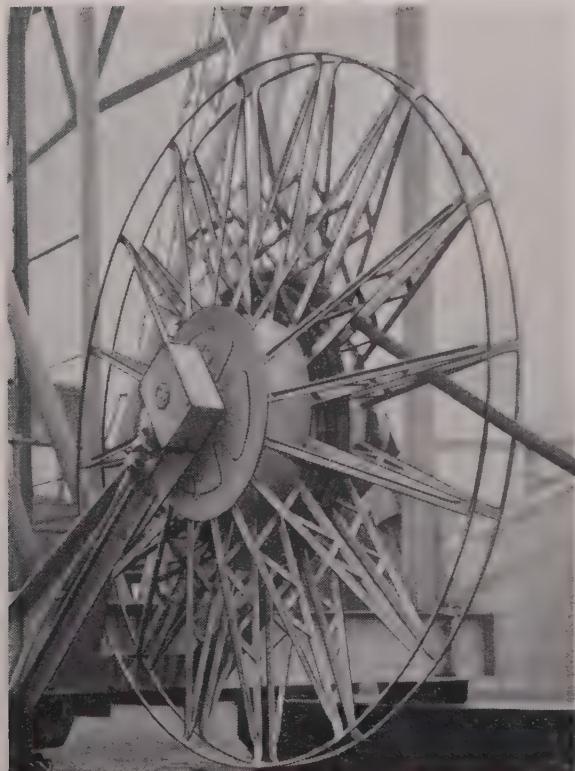
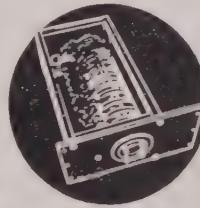
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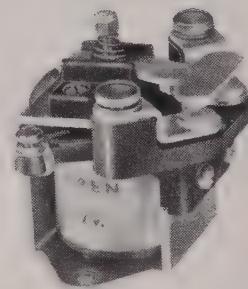
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163 Stanwell Road • Ashford • Middlesex

Telephone: ASHford 2798

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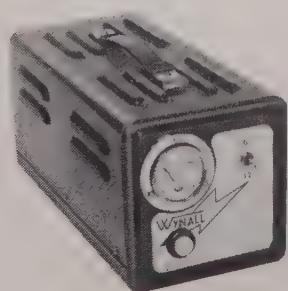


*Two examples from the* **WYNALL** *range—*

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All types of application in light electric traction

Relay panel giving 5 forward and 5 reverse speeds, 2 position rheostatic braking, auxiliary controls, safety inter-locking, adjustable automatic overload, complete plug and socket connections.



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for CARS, TRUCKS, TRACTORS, STATIONARY ENGINES

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High performance from this amazing unit. Under test conditions a  $6\frac{1}{4}$  litre engine (cold) immediately started with discharged battery. Operates from A.C. mains. Low cost. Super quality. Long life. No damage to batteries. Operates as normal battery charger when required.

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3,000 23 ft. long, drilled with 3 holes.  
4,500 28 ft. 6 in. long, drilled with 5 holes.  
500 33 ft. long, drilled with 9 holes.

Tender documents comprising tender specifications of the contract, etc., may be obtained from the Resident Engineer, Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2.

Each tender must be enclosed in a sealed envelope marked "Confidential, Tender for Supply of Wood Poles," and must be received at the Office of the Secretary, Electricity Corporation of Nigeria, Electricity Headquarters, 13, Broad Street, Private Mail Bag 2030, Lagos, Nigeria, West Africa, not later than noon on Monday, 1st May, 1961. Tenders received in any other manner will not be considered.

The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

Further information concerning this contract may be obtained on application to the Resident Engineer.

GEORGE W. NICOL,  
Secretary to the Corporation.  
8081

### PETERBOROUGH JOINT EDUCATION BOARD

Tenders: Peterborough Technical College Proposed Extension

#### Electrical Installation

TENDERS are to be invited from members of the Electrical Contractors' Association (Incorporated) or members of the National Register of Electrical Installation Contractors for the purpose of the placing of a sub-contract under a General Contractor for the Electrical Installation for a major extension of the Technical College buildings, comprising a floor area of approximately 42,500 sq. ft.

All Electrical Engineers desirous of tendering for the sub-contract are invited to submit their names and particulars to the undersigned by twelve noon on Wednesday, 5th April, together with a deposit of two guineas. Cheques should be made payable to the Peterborough Joint Education Board. From the list of applicants the Board will select a panel of contractors who will subsequently be invited to tender in accordance with instructions to be issued with the tender documents.

The Board does not bind itself to approve the lowest or any tender.

LESLIE TAIT,  
Chief Education Officer.

Education Offices,  
Town Hall,  
Peterborough.

8070

### CITY OF SALFORD

TENDERS are invited for the supply and delivery of the following materials during the period 1st July, 1961, to 30th June, 1962:—

1. ELECTRIC LAMPS.
2. ELECTRIC CABLES.

Application for forms of tender to be made to the Street Lighting Superintendent, 9, Frederick Road, Pendleton, Salford, 6. Tenders in plain sealed envelopes endorsed "Tenders for Electric Lamps and Cables" respectively must be returned addressed to the Chairman, Purchasing Committee, Town Hall, Salford, 3, not later than 5 p.m. on Tuesday, 4th April, 1961.

The Corporation does not bind itself to accept any or the lowest tender. 8079

### BASILDON URBAN DISTRICT COUNCIL

#### Street Lighting

TENDERS are invited for:—

- (1) Supply, delivery and erection of 99 Class B Tungsten Lamps on concrete columns.
- (2) Supply and delivery of 225 Pole Bracket Lamps.

Tender documents may be obtained from the Engineer and Surveyor, 88, Town Square, Basildon, Essex, and tenders must be returned to me by noon on 10th April, 1961, endorsed "Tender for \_\_\_\_\_".

A. HATT,  
Clerk of the Council.  
8080

### BOROUGH OF MORLEY

#### Street Lighting Department

TENDERS are invited for the supply and installation of 27 140-watt Sodium Lighting Units mounted on 25-ft. concrete columns in the Borough of Morley.

Forms of tender may be obtained from the Public Lighting Engineer, Town Hall, Morley, and must be returned to the undersigned not later than 9 a.m., Friday, 14th April, 1961.

E. V. FINNIGAN,  
Town Hall, Morley, Yorkshire.  
8071

### CITY OF MANCHESTER

#### Davyhulme Sewage Works Extensions: Stage 1B

#### Primary Sedimentation Tanks

TENDERS are invited for the supply, delivery and installation of approximately 600 lin. yds. of 415-volt, 4-core, 0.3-sq. in. P.I.L.C. S.W.A. & S. Cables.

Tender documents, returnable by 5th April, 1961, from the City Surveyor, Town Hall, Manchester, 2.

8048

### SITUATIONS VACANT

(See "Replies to Box Numbers" above)

#### DRAUGHTSMAN: PLANT AND SERVICES

EXPERIENCE desirable. Age range 16 to 30 say. O.N.C./H.N.C. qualifications specially considered. Location Westminster. Salary naturally to be decided in relation to experience, etc.

Details direct to Sir Alexander Gibb & Partners, Queen Anne's Lodge, Westminster, London, S.W.1.

8023

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW Dorset House, Stamford Street London, S.E.1

### EASTER

Classified Advertisements for the issue of 31st March should reach us by FIRST POST on FRIDAY, 24th March

Original testimonials should not be sent with applications for employment

### CENTRAL ELECTRICITY GENERATING BOARD

#### Eastern Division

APPLICATIONS are invited for the following appointments:—

Central Radiochemical Laboratory (Hornsey, North London)

ASSISTANT CHEMIST  
(S.V. No. 1448).

Salary N.J.B. Class AX, Grade 12, Scale 6, £830-£1,065 per annum inclusive of London weighting.

The applicant appointed will be required to work on the separation of low-level radioactive isotopes from agricultural samples.

Applicants should have a minimum qualification of Higher Certificate (Chemistry) and have had experience in analytical procedures.

ELECTRONIC MAINTENANCE ASSISTANT  
(S.V. No. 1449).

Salary N.J.B. Class AX, Grade 12, Scale 6, £830-£1,065 per annum inclusive of London weighting.

The successful applicant will be on work in connection with low-level radioactivity in agricultural samples.

Applicants should have a minimum qualification of Higher National Certificate and should have considerable experience in maintaining counting equipment.

Bradwell (Nuclear) Generating Station (Essex)

ASSISTANT CHEMIST  
(S.V. No. 1450).

Salary N.J.B. Class M, Grade 12, Scale 9, £1,115-£1,245 per annum.

Applicants should have considerable experience in providing the chemical services required by a modern generating station and should hold a minimum qualification of Higher National Certificate (Chemistry).

A knowledge of nuclear aspects is not necessarily required.

Applications, quoting the appropriate reference S.V. number, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 1st April, 1961. 8067

### CITY OF MANCHESTER

APPLICATIONS invited for the appointment in the office of the City Architect of an ASSISTANT ELECTRICAL ENGINEER (Permanent). Salary A.P.T. II, £815 to £960 per annum. Candidates should preferably have passed Section A or Joint Part I of the examination of the Institution of Electrical Engineers, or the Higher National Certificate. Should be capable of supervising work in progress on electrical lighting and power installations in all classes of buildings.

Five-day week. Removal expenses allowed.

Forms of application from the City Architect, P.O. Box 488, Town Hall, Manchester, 2. Returnable by 27th March, 1961. 8053

**Situations Vacant (continued)**

**CENTRAL ELECTRICITY  
GENERATING BOARD**

**Eastern Division**

**A**PPLICATIONS are invited for the following appointments :—

**South Denes (Great Yarmouth, Norfolk)  
Generating Station**

**FIRST ASSISTANT STATION CHEMIST** (S.V. No. 1455).

Salary N.J.B. Class J, Grade 8, Scale 10, £1,190-£1,325 per annum.

Applicants should have a minimum qualification of Higher National Certificate in Chemistry and should be familiar with the chemical services required in a modern generating station.

Knowledge and/or experience of problems associated with oil-fired boilers and ion-exchange plant would be an advantage.

**Electrical Department (System Development Section), Divisional Headquarters, Cockfosters (North London)**

**THIRD ASSISTANT ENGINEER** (S.V. No. 1456).

Salary N.J.B. Class AX, Grade 6, Scale 12, £1,285-£1,500 per annum, plus London weighting £50 per annum.

The successful applicant will be required to assist in the preparation of system reinforcement schemes entailing the technical and economic appraisal of schemes and the preparation of reports.

A knowledge of network analyser practice, symmetrical component analysis, and of the design of high-voltage transmission systems would be an advantage. Applicants should have had a sound technical training and experience in this type of work and/or in the construction and operation of high-voltage systems. They should preferably have qualifications in electrical engineering equivalent to Corporate Membership of the Institution of Electrical Engineers.

**THIRD ASSISTANT ENGINEER** (S.V. No. 1457).

Salary N.J.B. Class AX, Grade 8, Scale 10, £1,105-£1,325 per annum, plus London weighting £50 per annum.

The successful applicant will be required to assist in the preparation of system reinforcement schemes and in the carrying out of calculations of fault levels, load flows, etc., necessary for the technical and economic appraisal of design schemes. A knowledge of network analyser practice, symmetrical component analysis and of the design of high-voltage transmission systems would be an advantage.

Applicants should have had a sound technical training and should preferably have qualifications in electrical engineering leading to Corporate Membership of the Institution of Electrical Engineers.

**FOURTH ASSISTANT ENGINEER** (S.V. No. 1458).

Salary N.J.B. Class AX, Grade 9, Scale 9, £1,005-£1,245 per annum, plus London weighting £50 per annum.

The successful applicant will be required to assist in the preparation of system reinforcement schemes, including the calculation of fault levels and load flows, etc. A knowledge of network analyser practice and symmetrical component analysis would be an advantage.

Applicants should have had a sound technical training and should preferably have qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Applications, quoting the appropriate reference S.V. number, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, by 25th March, 1961. 8069

**CHIEF ELECTRICAL ENGINEER**

required for a power supply undertaking in GHANA. Minimum qualification A.M.I.E.E. Applicants should have had experience in generation and distribution up to 66 kV, preferably in senior position. Continuous contracts. Tours of 15 months with 3 months' leave on full salary. Free passages, furnished accommodation and medical attention. Provident fund operates.

Commencing basic salary £1,800 per annum.

Apply by letter stating age, full particulars of qualifications and experience, etc., to Box 631, c/o Walter Skinner Ltd., 20, Copthall Avenue, London, E.C.2. 7961

# BRUSH

**BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED**

**LOUGHBOROUGH, LEICESTERSHIRE**

(A member of the Hawker Siddeley Group)

## MECHANICAL AND ELECTRICAL DRAUGHTSMEN

Applications are invited from suitably qualified men who have had experience of the following type of work :—

**L.T. AND H.T. SWITCHGEAR (including circuitry)**  
**ROTATING ELECTRICAL MACHINES (200 to 5,000 k.w.)**  
**TRANSFORMERS**  
**MOTOR CONTROL GEAR**  
**GENERAL ENGINEERING**  
**DIESEL-ELECTRIC LOCOMOTIVES**

Attractive salaries (according to age and experience) will be paid, and in appropriate cases assistance with housing and removal expenses can be considered.

*Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of qualifications and experience and be addressed to :—*

Mr. A. Garner  
**BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED**  
Loughborough, Leicestershire  
quoting reference: PL.9926

7983

## ELECTRICAL DRAUGHTSMAN AND ESTIMATOR/DRAUGHTSMAN

required by

**J. LYONS & COMPANY LIMITED**  
(ICE CREAM DIVISION)

A vacancy exists for a SENIOR ELECTRICAL DRAUGHTSMAN required to have experience on General Distribution, Lighting, Motor Controls, Process and Sequence Controls associated with Automation. Some knowledge of Electronics would be an advantage.

A vacancy exists for a SENIOR ELECTRICAL ESTIMATOR/DRAUGHTSMAN required to have experience of Estimating for Electrical Contracting Installations, based on General Distribution Lighting, Motor Controls, Process and Sequence Controls. This will involve a certain amount of preparation of drawings to be used as a basis of estimates. H.N.C. desirable.

An attractive salary will be paid to the right men and the appointment offers good prospects for further advancement. The Company offers good conditions of service and a Contributory Pension Scheme.

Holiday arrangements honoured.

Applications will be treated in the strictest confidence and should be made in writing to :—

**The Personnel Manager**  
**Lyons Maid House, Hammersmith Grove, London, W.6**

7898

## LINDLEY THOMPSON

### MIDLAND SALES REPRESENTATIVE

A REPRESENTATIVE is required to promote sales in the Midlands to Area Boards and industrial users. Applicants should preferably have sales experience and some knowledge of power transformers.

Applications, which will be treated in strict confidence, stating experience and salary required, to :—

The Managing Director  
**LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD.**  
St. Mary's Road, Langley, Slough, Bucks

8043

## UNITED KINGDOM TECHNICAL ASSISTANCE

A N ACCOUNTANT is required in COLOMBO for SIX to TWELVE MONTHS by the GOVERNMENT OF CEYLON. Experience in all aspects of accounting in Electricity Boards, including construction, generation, transmission, distribution and revenue collection, but especially in costing of hydro-electric undertakings.

SALARY £2,000-£2,400 p.a. (subject to U.K. income tax) according to qualifications and experience, plus TAX FREE ALLOWANCE of £1,175 (married) or £675 (single), FREE FURNISHED ACCOMMODATION provided or allowance in lieu. All emoluments paid by U.K. Government.

Apply to Ministry of Labour (E.9), 26, King Street, London, S.W.1, quoting CEY/44. 8041

7961

**EASTERN ELECTRICITY BOARD**

**A**PPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

**Essex Sub-Area**

ENGINEER, Thurrock District  
(53/61.R).

Candidates should have had wide experience in the planning, construction, operation and maintenance of underground and overhead distribution systems (including substations) and should be capable of organising and supervising the engineering work of the District.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary N.J.B. Class G, Grade 3 (£1,500-£1,670) inclusive of London allowance.

Apply by letter to D. J. Agnew, A.M.I.E.E., Manager, Thurrock District, Eastern Electricity Board, Maidstone Road, Grays, Essex, by 31st March, 1961.

**FOURTH ASSISTANT ENGINEERS**

(a) Planning Section, Sub-Area Engineer's Dept., Northmet Sub-Area (Ref. 1006)

(51/61.R).

(b) Enfield District, Northmet Sub-Area (Ref. 1043) (52/61.R).

(c) Luton District, Chilterns Sub-Area (47/61.R).

Candidates for (a) should have had a good technical education and possess a Higher National Certificate or equivalent qualification, have a knowledge of substation plant and protective gear, be experienced in the design and layout of substations, and be capable of supervising site works.

Candidates for (b) and (c) should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary :—

(a) N.J.B. Class N, Grade 13 (£1,165-£1,295) inclusive of London allowance.

(b) N.J.B. Class G, Grade 11 (£875-£990) inclusive of London allowance.

(c) N.J.B. Class J, Grade 11 (£965-£1,090).

Apply by letter as follows :—

(a) The Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 27th March, 1961.

(b) A. T. Durbridge, Manager, Eastern Electricity Board, Enfield District, 40, Church St., Enfield, by 27th March, 1961.

(c) The Manager, Eastern Electricity Board, Luton District, 487, Dunstable Road, Luton, by 31st March, 1961.

**Northmet Sub-Area**

**THIRD ASSISTANT ENGINEER,**  
Stevenage District (Ref. 1030)  
(50/61.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary N.J.B. Class G, Grade 9 (£965-£1,090).

Apply by letter to H. L. Sumner, Manager, Eastern Electricity Board, Stevenage District, Walkern Road, Stevenage, Herts., by 27th March, 1961.

**Fens Sub-Area**

**GENERAL ASSISTANT ENGINEER**  
(Engineering Draughtsmen),  
Sub-Area Headquarters  
(48/61.R).

Candidates should be capable of preparing plans, estimates and detailed drawings associated with substation design and layout, reinforced concrete structures and other general building work.

Salary N.J.B. Class K, Grade 15 (£765-£870).

Apply by letter to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 31st March, 1961. 8082

**FOSTER TRANSFORMERS LTD.**

South Wimbledon, London, S.W.19

require TEST ENGINEER with good electrical background not necessarily on power transformers.

Apply to the Personnel Officer stating age and previous experience. 7864



(A Member of the Hawker Siddeley Group — Industrial Division)

## RESEARCH DIVISION INDUSTRIAL ELECTRONICS

### Sales Specialist Engineer

A Senior Engineer is required to act as Sales Specialist for a wide range of industrial electronic equipment which includes calculators, remote control devices, telemetry and a variety of instrumentation systems. Candidates should possess good academic qualifications and have had several years' experience in both technical and sales fields.

### Engineering Staff

Vacancies also exist for Senior and Intermediate Grade Research Engineers with at least three years' experience of applied research in one or more of the following fields:—

Instrument Design  
Pulse Circuitry  
Digital Computers  
Transistor Circuitry  
System Design  
Line Communication

Applicants for these posts should have at least a good Honours Degree in either Electrical Engineering or Physics. Where appropriate, appointments will be made as Section Leader or Group Leader.

The Company is situated on the outskirts of a small town, amid the pleasant Leicestershire countryside away from the smoky industrial environment. Schooling facilities are good for all grades of education, including advanced studies at technical colleges and universities in the district. In appropriate cases, assistance with housing and removal expenses can be considered.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of experience and qualifications and be addressed to:—

Mr. A. Garner

Brush Electrical Engineering Company Limited  
Loughborough, Leicestershire

quoting reference: PL.9929

8026



BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED  
LOUGHBOROUGH, LEICESTERSHIRE

(A member of the Hawker Siddeley Group)

### SALES DIVISION

### TENDERING AND CONTRACTS ENGINEERS

Applications are invited from suitably qualified men who wish to work in one of the following fields:—

#### ROTATING ELECTRICAL MACHINES SWITCHGEAR

Attractive salaries (according to age and experience) will be paid, and in appropriate cases assistance with housing and removal expenses can be considered.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of qualifications and experience and be addressed to:—

Mr. A. Garner

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED  
Loughborough, Leicestershire

quoting reference: PL.9927

7982

### PIONEER ELECTRIC CANADA

SENIOR TRANSFORMER DESIGN ENGINEER wanted. Minimum education HNC in Electrical Engineering. Minimum experience ten years in design of 5 kVA to 50 MVA transformers.

SWITCHGEAR DESIGN ENGINEER wanted. Minimum education HNC in Electrical Engineering. Minimum experience five years or more in design of metalclad and metal enclosed switchgear up to 15 kV with some knowledge of high voltage circuit breakers preferred.

Salaries \$6,500 to \$9,000 depending on qualifications. Full details (including photograph) re education and experience to:—

PIONEER ELECTRIC LIMITED  
1 Rockwood Place, Winnipeg 19, Manitoba, Canada

8057

**Situations Vacant (continued)****SOUTH EASTERN ELECTRICITY BOARD****FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER,**

Twickenham and Richmond District.

Salary scale at present N.J.B. Class F, Grade 5, £1,190 to £1,325 per annum, plus London allowance with progression to Grade 4 (maximum salary £1,410), subject to satisfactory service (re-classification to Class G anticipated in April, 1961).

Successful candidate will be responsible to the District Commercial Engineer and will be required to assist with tariff negotiations, sales activities, contracting, public lighting and general load development. Applicants must have suitable experience and should preferably possess a Higher National Certificate in Electrical Engineering or its equivalent. Consideration will be given to a private car allowance and assistance in house purchase in appropriate circumstances.

Applications quoting ER on forms from District Manager, SEEBOARD, 42, York Street, Twickenham, Middlesex, by 29th March, 1961.

**ASSISTANT DISTRICT ENGINEER,**

Croydon and Purley District.

Salary £1,325-£1,460 per annum, including London allowance under N.J.B. Agreement Class J, Grade 7. Superannuable. Applicants should be suitably qualified and experienced in the planning of distribution systems up to 11 kV. Candidates should also have experience in construction and maintenance work up to the same voltage.

Applications quoting ER and naming two referees on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 29th March, 1961.

**ASSISTANT DISTRICT ENGINEER,**

Lewes District.

Salary £890 to £1,015 per annum under N.J.B. Class E, Grade 8. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems.

Applications quoting ER and naming two referees to District Manager, SEEBOARD, 80/81 High Street, Lewes, by 29th March, 1961.

**ASSISTANT DISTRICT ENGINEER,**

Sutton District.

Salary £965-£1,090 p.a. under N.J.B. Class G, Grade 9, plus London allowance. Superannuable. Applicants should have had a good general education, be technically trained up to H.N.C. standard and must have had practical experience in general distribution work on H.V. and L.V. systems. Ability to plan and prepare schemes for mains extensions would be an advantage.

Applications quoting ER and naming two referees on forms from District Manager, SEEBOARD, 52, High Street, Sutton, by 29th March, 1961.

**FITTER (Electrical),**

East Sussex & South West Kent Sub-Area. Wages 5s. 6d. per hour for 42-hour, 5-day week under N.J.I.C. Agreement. The successful applicant will be based on the workshop at Eastbourne, but the duties will chiefly comprise erection and maintenance of switchgear and transformers in major substations in all parts of the sub-area.

Applications quoting ER and naming two referees on forms from Manager, SEEBOARD, Westlords, Willingdon Road, Eastbourne, by 27th March, 1961.

GEORGE WRAY,  
Secretary.  
8099

**NORTH WESTERN ELECTRICITY BOARD**  
**FOURTH ASSISTANT DISTRICT COMMERCIAL ENGINEER (Technical Sales and Service)**  
**BURY DISTRICT**

The successful applicant will be required to assist the Technical Sales and Service Engineer in connection with Industrial and Commercial Tariff matters. The duties will include the preparation of space heating schemes and the giving of advice to consumers on the most efficient and economical utilisation of electricity. Technical qualifications to H.N.C. standard desirable.

Salary Scale: £765/-£870 p.a. Grade H.13, N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2 St. George's Road, Bolton, and returned to him by 29th March, 1961.

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER  
ROCHDALE DISTRICT

Duties will include assisting the District Commercial Engineer in dealing with consumers' requirements, enquiries and records, including sale and installation of apparatus, repairs and maintenance, emergency service and tariffs, new supplies and development, control of workshops and service centres, and preparation of specifications and estimates.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,440/-£1,610 p.a. Grade H.4. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, and returned to him by 29th March, 1961.

8042

# Training for engineers in the Electricity Supply Industry

The Electricity Supply Industry employs 18,000 electrical and mechanical engineers in all parts of England and Wales. They are responsible for generating electricity in the power stations, transmitting it over the Grid, and distributing it throughout the country. To keep this key force up to strength as older staff retire and sales of power rise, the industry needs each year to recruit several hundred young men to its technical training schemes.

**Five-year apprenticeships** are available to school-leavers who hold a good Ordinary level G.C.E., including maths, and a science, or two Advanced level passes in maths. and physics. Training is by means of planned practical experience, combined with day or "sandwich" release leading to an engineering qualification.

**Two-year traineeships** are offered to graduates holding a degree in electrical or mechanical engineering from a British university. Training provides extensive and varied practical experience and satisfies the requirement of the professional institutions.

Those who already possess an engineering Diploma may also be considered for practical training. This will be planned according to the previous experience of the trainee.

On satisfactory completion of training, all apprentices and trainees are guaranteed employment in this essential and expanding industry. A wide range of careers is available, in many types of engineering, including research and commercial development.

*For further information write to:*

**The Education and Training Officer,**

**The Electricity Council, 12 Winsley Street, London, W.1.**

8015

**THE ROYAL COLLEGE, NAIROBI**

**A**PPLICANTS are invited for SENIOR LECTURESHIP in Electrical Engineering from Graduates with Corporate Membership of the Institution of Electrical Engineers.

Salary scale £1,950 × £75 to £2,475 p.a., entry point determined by qualifications and experience. F.S.S.U. Child allowance £50 p.a. per child (maximum £150 p.a.). Passages for appointee and family (up to four adult passages) on appointment, termination and leave (once every two years). Rent according to quarters provided £60-£114 p.a.

Detailed applications (6 copies), naming 3 referees, by 25th April, 1961, to Secretary, Inter-University Council for Higher Education Overseas, 29, Woburn Square, London, W.C.1, from whom further particulars may be obtained.

**LEEDS COLLEGE OF TECHNOLOGY**

Calverley Street, Leeds, 1

Principal: C. Chew, M.Sc.Tech., F.R.I.C.

**A**SSISTANT LECTURER GRADE B in Electrical Engineering required for 1st September, 1961.

Candidates should have appropriate technical qualifications and good industrial experience.

Full-time or part-time teaching experience is desirable.

Burnham salary scale £700 × £27 10s. to £1,150 a year, with full allowances for qualifications, training and previous experience.

Further particulars and form of application, to be returned by the 10th April next, may be obtained by sending a stamped addressed foolscap envelope to the Principal of the College.

GEORGE TAYLOR,  
Chief Education Officer.

Education Department,  
Leeds, 1.

8088

**CENTRAL ELECTRICITY GENERATING BOARD****South Western Division**

**G**ENERAL ASSISTANT ENGINEER (Efficiency) (Vacancy No. ER/AV/30/61) required at Portishead "A" Power Station.

Superannuation scheme. Salary N.J.B. Class J, Grade 13, Scale 5, £825-£940 per annum.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 27th March, 1961.

8090

**CENTRAL ELECTRICITY GENERATING BOARD**

East Midlands Division

**ASSISTANT PLANNING ENGINEER,  
CASTLE DONINGTON  
POWER STATION  
(Vacancy No. 39/61).**

Applications are invited for the position of ASSISTANT PLANNING ENGINEER at Castle Donington Power Station, near Derby.

Applicants should have received a sound theoretical and practical training in engineering, have experience on high-merit plant, and should have a clear and objective approach to power station planning problems.

Qualifications leading to corporate membership of a senior engineering institution are desirable.

Salary will be in accordance with Class L, Grade 8 (£1,350 - £1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th March, 1961.

**ASSISTANT EFFICIENCY ENGINEER,  
CASTLE DONINGTON  
POWER STATION  
(Vacancy No. 40/61).**

Applications are invited for the position of ASSISTANT EFFICIENCY ENGINEER at Castle Donington Power Station, near Derby.

Applicants should have received a sound theoretical and practical training in engineering. Experience in testing large high-merit plant would be an advantage.

Qualifications leading to corporate membership of a senior engineering institution are desirable.

Salary will be in accordance with Class L, Grade 8 (£1,350 - £1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th March, 1961.

**STATION SHIFT CONTROL ENGINEER,  
WARWICK POWER STATION  
(Vacancy No. 45/61).**

Applications are invited for the position of STATION SHIFT CONTROL ENGINEER at Warwick Power Station, Emscote Road, Warwick.

Candidates should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class E, Grade 10 (£765 - £870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications, 31st March, 1961.

**ASSISTANT ENGINEER (RELIEF),**WILLINGTON "A"  
POWER STATION  
(Vacancy No. 46/61).

Applications are invited for the position of ASSISTANT ENGINEER (Relief) at Willington "A" Power Station, P.O. Box 27, Derby.

Applicants should have received a sound electrical training and have had experience of the operation and control of modern high pressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class L, Grade 12 (£1,040 - £1,165 per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 31st March, 1961.

**ASSISTANT COAL AND ASH  
HANDLING ENGINEER  
HIGH MARSHAM POWER STATION  
(Vacancy No. 47/61).**

Applications are invited for the position of ASSISTANT COAL AND ASH HANDLING ENGINEER at High Marsham Power Station, Near Newark, Notts.

Candidates should have knowledge of handling rail borne coal supplies and the operation of ash handling and disposal plant.

Salary will be in accordance with Class N, Grade 10 (£1,350 - £1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 31st March, 1961.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,  
Divisional Controller.

The world's leading inventors and manufacturers of special purpose precision machinery for the Tobacco Industry have an opening in their London Drawing Office for :—

**SENIOR  
ELECTRICAL ENGINEER**

Desirable applicant should be aged 30-40, with considerable drawing office experience in the design of castings and small electrical parts for machining, technical qualifications at least up to H.N.C. level, and with practical experience in the design and application of control circuits for motors and electro-mechanical detector units. Some knowledge of electronics would be an advantage.

This opportunity is permanent and progressive; it offers immediate pensionable staff position with 3 weeks' Annual Holiday and attractive commencing terms.

Applications stating age, qualifications and experience should be personally addressed, in confidence, to

**G. B. Salmon****MOLINS MACHINE COMPANY, LTD.**

Evelyn Street, London, S.E.8

**RTB**

*Applications are invited from men aged between 21 and 30 years for the position of*

**TECHNICAL ASSISTANT  
to the Electrical Engineer**

on a modern integrated iron and steelworks where considerable development is taking place. The successful candidate will be employed on general duties connected with power plant, switch gear and control equipment.

Previous experience in heavy industry is desirable and Higher National Certificate in Electrical Engineering is the minimum qualification.

*Application forms are available from*

**The Manager, Staff and Labour Relations Department**

**RICHARD THOMAS & BALDWIN'S LIMITED**

Redbourn Works, Scunthorpe, Lincs.

*and should be returned by Friday, 24th March, 1961.*

**CITY OF LIVERPOOL EDUCATION COMMITTEE**

**College of Technology, Byrom Street, Liverpool, 3**

**PRINCIPAL : S. A. J. Parsons, B.Sc.(Econ.), M.I.Mech.E., M.I.Prod.E., M.B.I.M.**

**DEPARTMENT OF ELECTRICAL ENGINEERING**

Applications are invited for the appointment (full-time) of SENIOR LECTURER in ELECTRICAL ENGINEERING (LIGHT CURRENT).

Salary, £1,550 x £50 to £1,750 per annum (1959 Burnham Technical Report). Increments within the scale may be added to the commencing salary for approved industrial or professional experience or research work of an equivalent standard.

Applicants should have experience in electrical measurements and electronic engineering. They should possess an appropriate degree and hold a professional qualification, together with industrial and/or research and teaching experience. Research work will be encouraged and there are opportunities for the organisation of post-graduate courses. Duties to commence as soon as possible.

Application form (returnable by 31st March, 1961) and further particulars from H. S. Magnay, M.A., Director of Education, 14 Sir Thomas Street, Liverpool, 1.

**THOMAS ALKER,**

Town Clerk and Clerk to the Local Education Authority 8043

**DESIGN ENGINEERS**

Applications are invited for the following appointments :—

**SENIOR AND JUNIOR TRANSFORMER DESIGNERS**, preferably with experience in rectifier transformers up to 2 MVA.

Senior applicants should possess H.N.C. or equivalent qualification.

Staff pension scheme in operation.

Applications stating age, qualifications, salary range, and quoting reference ENG/MC, to :—

**Personel Manager**

**LANCASHIRE DYNAMO NEVELIN LTD.**

Hurst Green, Oxted, Surrey

## Situations Vacant (continued)


**MIDLANDS  
ELECTRICITY  
BOARD**

**A**PPLICATIONS are invited for the following superannuable posts:—

**North Staffs. Sub-Area  
SECOND ASSISTANT DISTRICT  
ENGINEER**  
(Stoke South District).

Duties include the construction, operation and maintenance of H.V. and M.V. mains and substations, up to and including 33 kV. Applicants should preferably have had experience in organisation and control of construction work on H.V. and M.V. underground and overhead mains and substations in an industrial District. Technical qualifications desirable. Salary £1,115/£1,245 per annum (N.J.B. Grade G.7). (It is expected that the District will shortly be reclassified to H.)

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

**South Staffs. and North Worcs. Sub-Area  
THIRD ASSISTANT DISTRICT  
ENGINEER (Wednesday).**

Applicants should have wide experience in all branches of distribution work, including construction, operation and maintenance of high-voltage and low-voltage underground cables and substations. Technical qualifications desirable. Salary £1,115/£1,245 per annum (N.J.B. Grade J.9).

Apply by letter within 14 days, stating age, qualifications, experience, present position and salary, to Mr. H. A. P. Caddell, Sub-Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

**Wolverhampton and District Sub-Area  
THIRD ASSISTANT DISTRICT  
ENGINEER (Cannock).**

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £890/£1,015 per annum (N.J.B. Grade F.9).

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,  
Secretary. 8049

**NORTH EASTERN ELECTRICITY BOARD**

**A**PPLICATIONS are invited for the following appointments which are subject to the conditions of the National Joint Board.

**Area Board Headquarters**

**SENIOR ASSISTANT ENGINEER** (Protection), Chief Engineer's Department, Technical Section, with location at Carliol House, Newcastle. Applicants must be fully conversant with the protective methods employed in the large scale distribution of electricity and have experience in the design, specification, installation and application of protective equipment in general. Corporate Membership of the I.E.E. will be an advantage.

Salary Schedule B, Class AX, Grade 1, £1,825/£2,085 per annum.

**Wear Sub-Area**

**THIRD ASSISTANT ENGINEER**, Sub-Area Engineer's Staff, Operation and Maintenance Section, with location at Sub-Area Headquarters, Sunderland. The successful applicant will be required to assist with the operation and maintenance of h.v. and l.v. overhead and underground distribution networks and substations, up to and including 66 kV. Qualifications leading to Corporate Membership of the I.E.E. will be an advantage.

Salary Schedule A, Class L, within Grades 10-11, £1,115/£1,325 per annum.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement. 8087

**COLLEGE OF ADVANCED TECHNOLOGY**
**BIRMINGHAM**
**DEPARTMENT OF ELECTRICAL ENGINEERING**

*Applications are invited for the posts of*

# Senior Lecturer Lecturer Assistant Grade 'B'

**Salary Scales:** Senior Lecturer £1,550 — £1,750  
Lecturer £1,370 — £1,550  
Assistant Grade 'B' £700 — £1,150

with additional graduate and training allowances where applicable. In fixing the commencing salary, account will be taken of teaching and industrial experience.

Further particulars and forms of application from the Bursar, College of Advanced Technology, Gosta Green, Birmingham, 4. Applications to be received within 14 days of this advertisement. Please quote 361I.

**K. R. PILLING, Clerk to the Governors.**

8039

## ELECTRICAL CONTRACTORS' ASSOCIATION (INCORPORATED) AND ALLIED ASSOCIATIONS

**T**HE above Associations invite applications for the post of CHIEF EXECUTIVE OFFICER. Experience in the electrical industry is desirable, but initiative, leadership, organising and negotiating ability are essential.

Applicants should apply to the President, 14, Bedford Row, London, W.C.I., for a form of application.

8051

**CENTRAL ELECTRICITY  
GENERATING BOARD**
**Midlands Division**

**A**SISTANT ENGINEERS are required at Meaford Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.12, £765 — £870 per annum.

These engineers will be expected to carry out shift relief duties and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 57/61MD, on form AE6, available from the Station Superintendent, Meaford Power Station, Nr. Stone, Staffs., to whom they should be returned when completed not later than 27th March, 1961.

8040

**SOUTH OF SCOTLAND  
ELECTRICITY BOARD**
**Stirling Area**

**T**HIRD ASSISTANT COMMERCIAL ENGINEER (Vacancy 15/61) required for the Falkirk District of this Area.

Candidates should have had a sound practical training in electrical engineering, and preferably be experienced in the work of a commercial department of an electricity supply undertaking. The possession of H.N.C. would also be an advantage.

N.J.B. conditions. Salary Class G, Grade 9, £965/£1,090 per annum. Superannuable post.

Applications, on the standard form obtainable from Area Manager, S.S.E.B., Woodlands, St. Ninians Road, Stirling, should be submitted not later than 3rd April, 1961.

8091

**ELECTRICAL DESIGNER**
**A.C. Rotating Machines**

**M**AWDSLEY'S LTD., of Dursley, specialists (H.N.C./Degree) ELECTRICAL ENGINEER to work under the Technical Manager on the design of A.C. motors and alternators (including 400-cycle).

Works training in the above products and 5-10 years' machine design experience are desirable.

The company has a contributory pension scheme and life assurance scheme, and will pay a good salary to the right man.

Applications should give full details, will be treated as absolutely confidential, and should be addressed to the Managing Director, Mawdsley's Ltd., Dursley.

8089

**W. H. ALLEN SONS & CO. LTD.**

require

**A SENIOR**
**SERVOMECHANISMS ENGINEER**

**A**PPLICANTS must have a sound knowledge of servo theory and be experienced in the design of circuitry using transistors. At least 5 years' experience, a degree or good H.N.C. are the minimum qualifications. Age 28-45.

Good prospects are open to the right man.

Write for application form and conditions of service, etc., to:—

**The Personnel Manager (Ref. 1007/2)**  
**Queens Engineering Works**  
**Bedford**

8028

## YORKSHIRE ELECTRICITY BOARD

## No. 6 (Hull) Sub-Area

THIRD ASSISTANT ENGINEER  
(Operation and Maintenance).

Candidates must be qualified electrical engineers and should have had experience in the operation and maintenance of all classes of distribution equipment, preferably up to 66 kV, and they should be able to undertake post-fault investigations of such equipment. They should also have a flair for statistics, report writing and calculations.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190-£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 30th March, 1961.

## No. 3 (Sheffield) Sub-Area

## ROTHERHAM AND MEXBOROUGH DISTRICT: SENIOR ASSISTANT (Records).

Candidates should be capable of supervising the District Consumers' Records Section and should preferably be experienced in all aspects of the Board's Standard Consumers' Procedure, and in the preparation of reports and statistics. They should also have experience in dealing with routine tariff and assessment queries and quotations for services charges.

Salary N.J.C. Grade 5, £1,020-£130/£1,140 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield 1, not later than 30th March, 1961. 8092

## FEDERAL GOVERNMENT OF NIGERIA

## INSPECTING ENGINEER

## ELECTRICAL INSPECTORATE

under the Chief Inspecting Engineer, Electrical Inspectorate Division, Federal Ministry of Mines and Power, to inspect and report on electrical supply undertakings and large consumers' installations, including factories, mines, oil wells, etc., and to investigate and conduct enquiries into electrical accidents.

Contract appointment for one or two tours on a salary range £1,434-£2,196. Gratuity of £37 10s. for each three months' satisfactory service. Quarters at moderate rent. Free passages. Allowance for children maintained in United Kingdom. Generous home leave.

Candidates must be A.M.I.E.E. or be exempt from the Institution's examination, and preferably have been apprenticed to an electrical supply undertaking or a large industrial works with at least seven years' post-qualifying experience in a responsible position involving the planning, erection and maintenance of indoor and outdoor switching and transformer stations, underground and overhead transmission and distribution systems operated at voltages of 11 kV and above. A thorough knowledge of the electrical regulations in force in the United Kingdom or elsewhere and their application is essential.

Candidates should write for application forms and further particulars, stating briefly age, qualifications and experience, to the Recruitment Attaché, Office of the High Commissioner for Nigeria, Nigeria House, 9, Northumberland Avenue, London, W.C.2, quoting Q.1/3.

8061

## ELECTRICAL ACCESSORIES REPRESENTATIVE

required for Scotland with a knowledge and connection within the electrical industry. Excellent opportunity for the right person, together with a pension scheme, car, etc.

S. O. BOWKER (TENBY)

19/21, Warstone Lane, Birmingham, 18  
8056ENGLISH ELECTRIC  
DESIGN AND DEVELOPMENT  
ENGINEERS

## A.C. and D.C. MACHINES

A number of opportunities exist at Stafford Works for Technologists who wish to make a fundamental contribution to the advancement and refinement of our products.

## SWITCHGEAR

The most suitable candidates will hold degrees and will have had some years' specialised training and experience; and will be looking for openings that will prelude progressive careers with particular companies.

## TRANSFORMERS

## RECTIFIERS

Suitable recruits will be entitled to excellent and permanent staff conditions of service; and removal and housing assistance will be given where necessary.

Write, giving full details, to the

Technical Staff Officer

Dept. G.P.S., English Electric House, Strand, London, W.C.2

quoting reference ER 1296 N

8055

AEI

## Associated Electrical Industries Limited

Switchgear Division, Higher Openshaw

## PUBLICITY LIAISON

A vacancy occurs in a small department responsible for the collection and preparation of material for publicity use generally, including the drafting of technical sales leaflets, in an important manufacturing unit of AEI. The duties call for intelligent application to the work of fact finding and a willingness to maintain in a methodical manner the routine work involved.

An engineering (preferably electrical) background is desirable.

Application should be made to:—

The Personnel Manager (Y.18)

A.E.I. Ltd., Switchgear Division

Higher Openshaw, Manchester, 11

8050

## CENTRAL ELECTRICITY GENERATING BOARD

## Midlands Project Group

## Third Assistant Engineer (Electrical)

## Drakelow "C" Power Station

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER (Electrical), at Drakelow "C" Power Station. The person appointed will be required to work at the Group's Headquarters, Bournville, in the first instance, subsequently transferring to the Drakelow "C" site.

Candidates should have a fundamental training in electrical engineering. Experience in the manufacture, erection, maintenance and operation of electrical plant as installed in grid substations is desirable. Appropriate technical qualifications would be an advantage. The salary will be within Grade 7, Scale 13 (£1,285-£1,610 per annum) of the National Joint Board Agreement.

Candidates should be made on standard form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham, 30, and should be returned to him not later than 29th March, 1961.

Envelopes should be marked "Confidential, Staff Vacancy Number MPG.13/61." 8084

## SOUTHERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER  
Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 13 (£715-£805 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with distribution including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1333, not later than 27th March, 1961.

## SURVEYOR

Yeovil District of No. 4 (Bournemouth) Sub-Area, located at Shaftesbury. Salary N.J.C. Grade 2 (£700-£775 per annum). N.J.C. conditions of service.

Candidates should have a sound knowledge and experience of general survey work with ability to peg overhead lines and prepare profiles and plans from surveyed elevations.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1284, not later than 27th March, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 8085

## Situations Vacant (continued)

**J. & P.**

**SENIOR APPOINTMENTS  
WITH  
ELECTRICAL MANUFACTURING  
COMPANY IN CALCUTTA**

**SALES MANAGER**

Due to expansion it is proposed to appoint a Sales Manager in the switchgear and motor manufacturing division of a company in Calcutta. Applications are invited from persons having technical qualifications and experience in these or similar products. There are opportunities for considerable extension of the business and of personal advancement.

**MANAGER for SWITCHGEAR DEPT.**

A switchgear engineer is required to be responsible for the technical and production control of the Switchgear Department of the factory in Calcutta producing industrial switchgear up to 11 kV. This is a responsible and permanent appointment with good prospects of advancement. Extensive factory expansion is programmed.

If you are interested in either of the above appointments, you are invited to send details of your qualifications, experience and present salary, in confidence, to the

**Director and General Manager  
JOHNSON & PHILLIPS LTD.  
Charlton, London, S.E.7**

8014

**ELECTRICITY BOARD FOR NORTHERN IRELAND**

APPLICATIONS are invited for the appointment at the Board's Head Office, Danesfort, 120, Malone Road, Belfast, 9, of CHIEF TECHNICAL ASSISTANT directly responsible to the General Manager and Chief Engineer.

Candidates, who should not be more than 45 years of age, must have a University Degree in Electrical Engineering, be a Corporate Member of the Institution of Electrical Engineers, have had a sound engineering training, preferably in the works of a manufacturer of steam turbine and electrical equipment, and good practical experience in the installation and operation of mechanical and electrical equipment on an interconnected electricity supply system with large modern steam power plant, E.H.T. transmission and L.T. distribution. They should also be familiar with, and have had experience in, the planning, development and technical aspects of such a system.

The salary will be in accordance with Scale No. 18, Grade 1, Class K of the Northern Ireland Electricity Supply Industry Joint Board Schedule, viz., £2,050 plus 3 x £35 and 2 x £40 to £2,235 per annum.

Membership of the Electricity Board (Northern Ireland) Superannuation Fund will be a condition of the appointment.

Applications which should set out concisely age, education, degrees and other qualifications and details of practical experience, accompanied where possible by copies of testimonials, should be sent so as to reach the Secretary of the Board at the above address not later than Wednesday, 5th April. Envelopes should be marked "Confidential."

**ELECTRICAL  
ENGINEER**

to be responsible direct to the Board, controlling several groups of Senior Contracts Engineers. Must be fully experienced in all aspects of electrical contracting organization; preferably qualified; aged 40-50.

Salary in region of £2,500 per annum, with participation in profit-sharing scheme. Company car. Contributory pension scheme.

Prospects of appointment to Board after satisfactory period of employment.

Please write, giving full details of age, qualifications, education and past experience to—Box ER.362, c/o Hanway House, Clark's Place, London, E.C.2.

8100

**SOUTH WALES  
ELECTRICITY BOARD**

**SUB-AREA  
COMMERCIAL ENGINEER  
CARDIFF AND EAST CENTRAL  
SUB AREA**

APPLICATIONS are invited for the position of COMMERCIAL ENGINEER of the Cardiff and East Central Sub-Area based at Cardiff.

The salary for the position will be in accordance with Class D, Grade 5, of the National Joint Managerial and Higher Executive Grades Committee, namely £2,380-£2,595 per annum.

The successful applicant will be responsible for the functional control and supervision of the Board's commercial activities in the Cardiff and East Central Sub-Area (covering Cardiff and East Glamorgan), and to advise the Sub-Area and District Managers on all aspects of commercial development.

Candidates should preferably be Chartered Electrical Engineers, with wide experience in all branches of consumer service, and a good record in the development of all types of contracting work and appliance sales.

Applications should be addressed to the undersigned at St. Mellons, Cardiff, to arrive not later than Wednesday, 5th April, 1961. Please endorse envelope, "Sub-Area Commercial Engineer."

R. G. WILLIAMS,  
Secretary.

8095

**HIGGS MOTORS LTD.**

**WITTON  
BIRMINGHAM 6**

REQUIRE

**CHIEF ELECTRIC  
MOTOR DESIGNER**

★

**FIRST-CLASS MAN  
CAPABLE OF EARNING  
TOP EXECUTIVE  
SALARY**

8052

**TURRIFF GROUP  
OF COMPANIES**

at Turriff Building

**TECHNICAL  
STAFF APPOINTMENTS**

Senior, Intermediate and Junior

**DESIGN DRAUGHTSMEN**

are offered appointments on  
**ELECTRICAL LAYOUTS AND  
SCHEMES.**

ATOMIC ENERGY.

RADIO COMMUNICATIONS.  
TRANSMITTING AND RECEIVING  
STATIONS.

AERONAUTICAL RESEARCH  
FACILITIES.  
COMMERCIAL AND INDUSTRIAL  
PROJECTS.

Choose your own sphere of interest and  
contact us.

Attractive salaries. Bonus, pension and  
assurance schemes. Modern offices.  
Staff restaurant on premises. 5-day week.

Please call or write:—

**Group Personnel Officer  
TURRIFF BUILDING  
Great West Road  
Brentford, Middlesex**

8072

**WESSEX REGIONAL HOSPITAL BOARD**

THERE are vacancies for the following posts in the Architect's Department to deal with the Board's expanding hospital building programme:—

**ENGINEERING DRAUGHTSMEN,  
GRADE I**  
(£1,030 x £35 (2) x £50 (3) to £1,250).

**ENGINEERING DRAUGHTSMEN,  
GRADE II**  
(£870 x £35 (4) to £1,010).

Training in hospital engineering services will be given. It is preferred that applicants should hold one of the Higher National Certificates, or Sections A and B of the Institution of Heating and Ventilating Engineers' examination, or an equivalent qualification. These appointments offer an excellent opportunity for gaining experience in the installation of mechanical engineering services in new hospital buildings or the replanning of existing services for major adaptations.

Please apply to the Secretary, Highcroft, Romsey Road, Winchester, for application form, which should be returned by 31st March.

8037

**SOUTH OF SCOTLAND  
ELECTRICITY BOARD**  
Fife Area

**SECOND ASSISTANT DISTRICT  
ENGINEER, WESTERN DISTRICT.  
SECOND ASSISTANT DISTRICT  
ENGINEER, EASTERN DISTRICT.**

Applications for the above posts are invited from Engineers with a sound training and subsequent experience in H.V. and L.V. distribution systems.

Candidates should possess the H.N.C. in Electrical Engineering or equivalent.

N.J.B. conditions, and salary N.J.B. Class G, Grade 7, Scale 9, £1,115/£1,245 p.a.; post superannuable, subject to satisfactory evidence of health. One post is based on Dunfermline, the other on Cupar.

Applications on standard form, obtainable from the Area Manager, S.S.E.B., East Port, Dunfermline, should be returned to him not later than Friday, 24th March, 1961.

8024

**NORTH OF SCOTLAND  
HYDRO-ELECTRIC BOARD**

**Assistant Engineer (Research)**

APPLICATIONS are invited for the above appointment at the Research Laboratory, Pitlochry. The work comprises investigations, design and development of prototype equipment for measurement, control and methods generally embracing electronic technique. The minimum technical qualification is the Higher National Certificate.

Experience with a manufacturing company or a supply undertaking is preferred.

Salary N.J.B. Class AX, Grade 8, Scale 8, (£1,105-£1,325), with placing in accordance with experience and qualifications. Technically qualified but inexperienced applicants may be offered a lower Grade.

Applications should be made on a standard form which may be obtained from the Research Engineer, North of Scotland Hydro-Electric Board, Ferry Road, Pitlochry, Perthshire, to whom completed forms should be returned within 14 days from the appearance of this advertisement.

**BRACKNELL DEVELOPMENT  
CORPORATION**

**Assistant Engineer (Electrical)**

APPLICATIONS are invited for the above appointment on the staff of the Chief Engineer at a salary in Grade A.P.T. IV, £1,140 to £1,310 p.a.

Applicants should have the Higher National Certificate in Electrical Engineering and have had several years' experience in the design and installation of lighting, power and allied services in factories and commercial premises.

Housing available. Superannuation scheme, medical examination.

Apply by 10th April, 1961, giving age, education and qualifications, experience and appointments held (with dates and salaries) and names of two referees to General Manager (A.E.E.), Bracknell Development Corporation, Farley Hall, Bracknell, Berkshire. 8083

**DRAUGHTSMEN  
REQUIRED**

**WITH EXPERIENCE OF  
CIRCUIT DIAGRAMS  
FOR LIFT CONTROL  
SYSTEMS**

•  
APPLY REF.: C.R.W.  
J. & F. HALL LTD.  
DARTFORD  
KENT

8011

**CROMPTON PARKINSON  
LIMITED**

invite applications for positions as CONTRACT ENGINEERS at Chelmsford and Provincial Branches. Must be capable of preparing, tendering for and handling composite schemes involving the engineering application of switchgear, transformers, rotating plant and other products. Additional knowledge of cable work an advantage. Constructive and interesting work, including site visits throughout the U.K. and sometimes abroad. Superannuation scheme.

Write stating age and details of previous experience to Manager, Contract Department, Chelmsford. 8059

**ELECTRONIC ENGINEER**

M A W D S L E Y'S LTD., OF GLOUCESTERSHIRE, manufacturers of special-purpose rotating electrical machinery, wish to employ a young qualified (e.g., Degree or H.N.C. (E.), with Electronic Endorsement) ELECTRONIC ENGINEER on development work in their Experimental Department, and to maintain liaison with an associated company on the development and application of electronic control equipment. Experience in electronics and/or light current engineering essential.

An adequate salary will be paid to the right man; the company has a good pension and life assurance scheme.

Applications will be treated in strictest confidence and should be sent to the

**Managing Director  
M A W D S L E Y'S LTD.  
Dursley, Glos.**

7979

**DESIGN ENGINEER  
(ELECTRICAL)**

A LARGE London company concerned with the design and installation of electrical services for factories, laboratories, offices and other buildings wishes to appoint a

**SENIOR  
DESIGN ENGINEER.**

Applicants for this important position must have experience of directing a design section engaged on these types of projects.

The initial salary envisaged is in the region of £1,750 p.a., and prospects for early advancement are very good for the right man.

Applications, giving full details of past and present positions, should be addressed to the Personnel Manager,

Box 8101

**MERSEYSIDE AND NORTH WALES  
ELECTRICITY BOARD**

**Staff Vacancy Notice**

**No. 4 Sub-Area**

TRAINEE DEMONSTRATOR required in the Caernarvon District of the Board's No. 4 Sub-Area, based on Caernarvon.

Salary within the range £265/£565 per annum, according to qualifications and experience, providing £320/£350 per annum approximately at 18/19 years of age.

Applicants should have completed a full-time course of not less than two years at a domestic training centre and be prepared to continue with studies. A knowledge of electrical appliances will be an advantage. The ability to speak Welsh is desirable.

The post is active and interesting, involving wide contact with the public, particularly women's organisations, schools and housewives.

Promotion to Demonstrator will depend on vacancies existing on completion of training, which would be approximately three years.

Good holidays, sick pay and pension scheme. Appointment subject to medical examination.

Standard application forms obtainable from the Manager, No. 4 Sub-Area, Rhosyllen, Nr. Wrexham, or from any District Office.

Closing date, 27th March, 1961.

Previous applicants need not re-apply. 8058

**ELECTRICAL ENGINEER**

required by Trinity House, London (the General Lighthouse Authority for England and Wales) to be in charge of the Electrical Branch of the Engineer-in-Chief's Department.

Design and installation experience of a wide range of electrical equipment, including small scale distribution, generators and motors up to 50 kW/h.p. and small electro-mechanical devices, is required. Experience of light current relay circuitry and techniques associated with automatic control and instrumentation of industrial plant is desirable and some knowledge of the application of electronics, including semiconductor devices, to control systems, or telecommunications experience would be an advantage.

The post is a responsible one requiring a sound background of electrical engineering and experience in the control of subordinate staff. The preferred age limits are 35-40 years, but candidates outside these ages will be considered.

The minimum qualification acceptable is Corporate Membership of the Institution of Electrical Engineers.

Salary scale £1,515 p.a. rising by various annual increments to £2,015 p.a.

Applications should be made in writing to the Secretary, Trinity House, Tower Hill, London, E.C.3, not later than 27th March, 1961, stating age, present occupation, qualifications and experience and enclosing copies of testimonials.

8098

**SOUTH WALES SWITCHGEAR LIMITED**

have vacancy for MANAGER for Scotland to take charge of sales and contracts for this area. This position provides excellent opportunity for successful candidate to develop the company's activities in this area.

Applications will be treated in confidence and should be addressed to the

**General Manager  
SOUTH WALES SWITCHGEAR LTD.  
Blackwood, Mon.**

8096

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APPLICATIONS are invited for the position of:-

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OFFICE MANAGER**

Applicants must be technically conversant with electricity meters, all types, and ancillary apparatus, including test equipment, etc., able to handle all technical enquiries and quotations, home and export markets, and should be good correspondent and customer contact. Good salary and prospects of promotion. Superannuation scheme, etc.

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Rowan Road  
Streatham Vale, London, S.W.16**

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FOR CANADA**

TECHNICIANS with experience in the construction and adjustment of measuring potentiometers, bridges and resistance standards required. Health insurance and pension plans available.

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Smiths Falls, Ontario, Canada**

8010

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## WORKS MANAGER AND ELECTRICAL ENGINEER

A N appointment will shortly become available as WORKS MANAGER to a small company in Cheshire possessing established sales connections with manufacturers of electrical equipment, local authorities, contractors and T.V. trade.

Some previous management experience is essential, together with a good general knowledge of the electrical industry. In addition, the directors would welcome new manufacturing proposals. Applicants should be qualified to accept a directorship, assuming satisfactory progress.

Educational and career details should be forwarded in confidence to—Box 8012.

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District Commercial Engineer  
South District, Cheadle

DUTIES will include the organisation and control of commercial staff and functions in the District; supply of information and advice to consumers on all commercial matters; control of contracting section; control of service centres and exhibitions.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,535/£1,720 p.a. Grade G.2. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, and returned to him by 29th March, 1961. 8093

ADMINISTRATIVE assistant required for contracts manager of large London electrical company. To control the preparation of accounts, trading reports, statistics, etc., and personnel. The position is superannuated after a probationary period and has good prospects for an individual capable of working under his own initiative. Previous similar experience in contracting an advantage. Reply to—Box 8003.

MARINISTRY: (a) Station engineers (general duties); (b) Station engineers (mechanical); (c) Clerks of works (building). Pensionable posts (50 for (a), 10 for (b), 50 for (c)) for men at least 25 and under 40 on 1.1.61 (with extension for regular forces service and overseas civil service), with appropriate O.N.C. or equivalent technical qualification. For (a) and (b) comprehensive engineering apprenticeship followed by at least 3 years' experience in an electrical or mechanical engineering firm, preferably on operation and maintenance work, is essential. Supervisory experience and, for (a), knowledge of heating and ventilating plant and diesel engines an advantage. For (c) apprenticeship, training in a building school, experience as journeyman in a building trade, or at least 3 years' experience in estimating, costing and management in a builder's general office is essential, followed by further appropriate experience including at least 3 years as foreman or clerk of works. Ex-R.A.F. clerks of works or station engineers who do not possess these qualifications may be considered if they have at least 3 years' relevant experience. Starting salary (national rate) £801 at 25 to £884 at 28 or over. Scale maximum £988. Promotion prospects. Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting S/5269/61. Closing date 6th April, 1961. 8022

ASSISTANT electrical engineer required for interesting work in the design, planning and installation of complete power and lighting schemes for coal handling, screening and preparation plants. Age preferably not above 30, with a minimum qualification of Ordinary National Certificate in Electrical Engineering. Apply giving full details to—W. J. Jenkins & Co. Ltd., P.O. Box No. 3, Retford, Notts. 8065

ASSISTANT storekeeper required for electrical contractors in London W.C. area. Wages commence approx. £12 10s. p.w. Own pension scheme. Good prospects. All applications will be acknowledged.—Box 7943.

CABLE estimator required. Applicants should have had experience in estimating procedures for rubber, synthetic rubber and thermoplastic cables of all types. Duties to include preparing quotations and direct contact with customers when necessary. Staff pension scheme. Canteen facilities available. Replies to be addressed to—Sales Manager, The General Cable Mfg. Co. Ltd., 69, Kingston Road, Leatherhead, Surrey. 8030

CONTRACTS engineers required for London office. Previous experience preparation of specifications for electrical installations essential. Post involves some site supervision. Paid holiday this year. Salary according to age, experience, bonus. Apply—C. MacKechnie Jarvis & Partners, 34, Victoria Street, London, S.W.1 (Phone, ABBey 6712). 8074

draughtsman required by Royal Arsenal Estate, War Office, Woolwich, with design exp. in electric lighting, heating and power distribution. O.N.C. or equiv. qualis. and appropriate practical exp. essential. Salary £638 (age 21) to £945 (age 28), rising to £1,033 p.a. 5-day week, 18 days' annual leave, plus public holidays. Payment for overtime and sick leave. Apply giving exp. to Secretary, Royal Arsenal Estate, Royal Arsenal, Woolwich, London, S.E.18, or any Employment Exchange, quoting Woolwich 277/278. 8045

LECTRICAL draughtsman required by Westminster consultants. Age range 22-28. Practical experience more essential than academic qualifications. Post offers advancement and experience in wide range of work. In first instance details, please, of experience and employments to—Box 8032.

LECTRICAL estimating clerk, preferably with experience of estimating and costing, but consideration will be given to young electrical engineers without commercial experience. —H. Featherstone Ltd., 22, London Road, Tunbridge Wells. 8018

LECTRICAL site foremen, chargehands and electricians wanted for large contracts in London, Midlands and Wales. Conduit and M.I.C.C. installations. Write—Box 7931.

LECTRICAL wholesaler in the N.W. London area requires representative. Opportunity presents itself for young engineer with technical ability and knowledge of electrical contracting to join expanding company. Remuneration by way of salary plus expenses, and new company car provided. Write giving full details of previous career and experience.—Box 8073.

ENGINEER-surveyors (electrical) required by leading engineering insurance company in Leeds, Gateshead, Glasgow, Birmingham, London (Middlesex). Applicants should possess a Higher National Certificate in Electrical Engineering and have had practical experience with electrical plant and machinery. Age about 30. Salary £825/£1,225. Non-contributory pension. Apply to—Vulcan Boiler & General Insurance Co. Ltd., 67, King Street, Manchester, 2. 8046

ESTIMATING/supervising and/or design E and also junior engineer required for progressive positions for high-class installation work in an expanding company. Write in confidence stating age, experience and salary required to—Alliance Electrical, 2, Henrietta St., London, W.C.2. Progressive salary with possibility of a non-contributory pension and free life assurance. 1118

ESTIMATING/supervising engineers required for electrical contractors' London office. Applications, stating experience, salary, etc., to—Box 8066.

XPANDING company manufacturing specialised conduit, trunking and accessories requires man to take charge of sales department, ultimately becoming sales manager. Knowledge of trade essential. Excellent prospects. Apply stating age, experience, salary required to—Box 8019.

JUNIOR contracts engineer. Post would suit man working for H.N.C. and offers first-class opportunity for extending experience electrical installations in schools, hospitals, factories, etc. Paid holiday 1961. Good salary, bonus. Apply—C. MacKechnie Jarvis & Partners, 34, Victoria Street, London, S.W.1 (Phone, ABBey 6712). 8075

MAJOR cable contractor operating in the N.E. area has vacancy for the superannuated post of supervising engineer. Applicants should hold O.N.C. or H.N.C. in Electrical Engineering. Similar experience with a major cable company or area board would be an added advantage. Apply stating age, experience and salary required to—Box 7968.

MANAGER for electrical contracting department required. Must be familiar with medium to large industrial and commercial installations. Write giving full details of age, experience and salary required to—Simpson Brothers (of Hapton) Ltd., Hapton, Burnley, Lancs. 8031

SLER & FARADAY Ltd. have a vacancy for a man with knowledge of lighting fittings assembly and stock-keeping for their showrooms and stores. 5-day week. 89-91, Newman Street, London, W.1. 195

RODUCTION manager required for factory in East Kent producing diesel electric plant. This is a new appointment arising from rapid expansion of a young concern and offers practically unlimited prospects. Proven experience is essential, but we seek also the flexibility and initiative required to create an efficient works given a good foundation and full backing. Write in first instance complete history and salary required to—Box 8020.

REPRESENTATIVE required by established R Essex and North London wholesalers. Experienced man with contacts in contracting, retail and industrial fields preferred but not essential. Salary, commission and car allowance, also superannuation scheme. Write details, etc., to—Box 7933.

REPRESENTATIVE required by firm in R East Kent for range of arc welding machines in home market among mainly factories and contractors. On suitable commission basis to those already established in these circles and whose present products do not conflict. Write in confidence to Managing Director, c/o Box 8021.

QUIRED by electrical engineering company, Great West Road, young man aged between 18 and 24, with some previous experience of preparing quotations, general correspondence and sales routine, or alternatively undergoing technical training with a view to indoor sales career. Successful applicant must have drive and ultimately be able to work on own initiative. Canteen facilities, pension and bonus schemes in operation. Reply in confidence stating experience and expected salary to—Box 7859.

QUIRED by London electrical contractors, a contracts manager for their London office. Applicants must have a wide experience of the contracting industry, first-class knowledge of office administration, and be able to control office staff and supervisory staff. Reply stating age, experience and salary required to—Contracts Director, Giles (Electrical Engineers) Ltd., 37/41, Bedford Row, London, W.C.1. 8076

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, Spring and Summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 142

SENIOR electrical draughtsman required in S Surrey by leading furnace company. Permanent position with opportunity for advancement. Work includes preparation of schematic and wiring diagrams associated with medium-voltage and power industrial equipment; knowledge of sheet metal cubicle construction an advantage. Good salary and working conditions. Five-day week. Pension scheme. Canteen. Flat available. Apply—EFCO Furnaces Ltd., 161, Queens Road, Weybridge, Surrey. 8033

SENIOR electrical installation draughtsman for office of consulting engineers, Westminster. Permanency, good salary and conditions, pension scheme.—C. W. Glover and Partners, Francis House, Francis Street, London, S.W.1 (Telephone, VICToria 5418). 8076

SUPERVISING engineer, experienced, required by expanding firm of electrical contractors N.W. London. Progressive position. Pension scheme. Write stating age and experience to—Box 196.

SURVEYOR required for wood pole line work. Permanency right man. Kirriemuir area.—B. French Ltd., Pike Mills, Kidderminster. 7897

TECHNICAL sales engineer required by prominent switchgear and busbar trunking manufacturer, resident in Glasgow or Edinburgh, preferably with existing connections. Car provided. Non-contributory pension scheme in operation. Applicants should state age, experience and salary required.—Box 8047.

**TRANSFORMER** designer. To lead and control design and drawing office. A person of wide experience coupled with ability and enthusiasm is required. The position carries commensurate salary and promising future. Apply in writing—Willesden Transformer Company Ltd., Manor Park Road, Harlesden, London, N.W.10. 309

**YOUNG** man required for development work on rectifier control circuits. H.N.C. and some relevant experience desirable. Apply—P. G. Davies, Hackbridge & Hewitt Electric Co. Ltd., Hersham, Walton-on-Thames. 8068

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**A**.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W.4. 57

**A**BACOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish, vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burycote House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

**A**.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeyport Lane, Stanmore, Middx. (Edgware 5566/9). 91

**A**.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/- Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

**A**.C. and D.C. slotmeters and quarterlies. Reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. London agents, phone Downland 4682 (Surrey). 5001

**A**LTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (Clerkenwell 5512). 24

**A**LTERNATORS for sale from 1,100 kVA at 750 r.p.m. down to  $\frac{1}{2}$  kVA. Single and three-phase. All voltages. More than 150 machines in stock. Automatic regulators and switchboards available.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

**A**LTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

**B**ARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2, Ring Monarch 3355. 50

**B**ILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

**C**ABLE, underground, all types ex stock.—E. M. Tattan & Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5). 117

**C**ABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYAL 5905). 316

**C**IRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

**C**ONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

**C**RANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

**D**ISEL generating sets, all sizes to 500 kW.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

**E**LECTRIC motors and generating equipment.—E. M. Tattan & Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5). 116

**E**LECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

**E**LECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, z. 54

**F**LUORESCENT tubes reconditioned and guaranteed with a life as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Olive Street, Bury (Telephone, Bolton 27251). 212

**F**OR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

**G**EARED motorised units. If the call is urgent within the fractional range, phone CLE. 4141.—Jeary Electrical, 132, East Road, London, N.1. 127

**G**ENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

**I**NSULATING varnish, clear, Minerva No. 720, £10 per 40-gal. drum.—Lowton Metals Ltd., Sandy Lane, Lowton St. Mary's, Leigh, Lancs. (Tel. 71441/2). 93

**K**ARDEX, Roneodex and Shannovue cables, nets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

**M**OTOR generator sets and converters, all sizes and voltages from  $\frac{1}{2}$  kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 122

**M**OTORS and control gear, huge stocks all types,  $\frac{1}{2}$  to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (5444/7). 70

**N**AMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

**P**HASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

**P**ЛАTING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

**P**OLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

**P**REPAYMENT is. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

**P**URLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

**Q**UARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

**R**OTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

**S**MALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screw & Repetition Co. Ltd., Woodgate, Leicester. 180

**T**ELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton (Elmbridge 2234/5/6). 172

**V**ENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

**W**ARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

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**500**-kW, 220-volt Met-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

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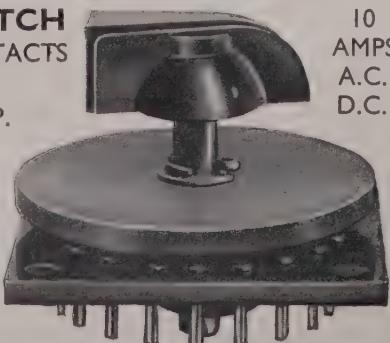
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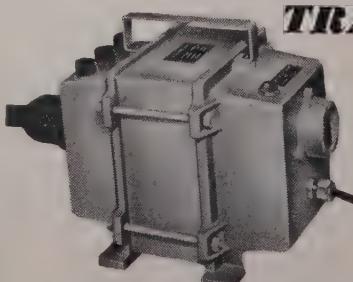
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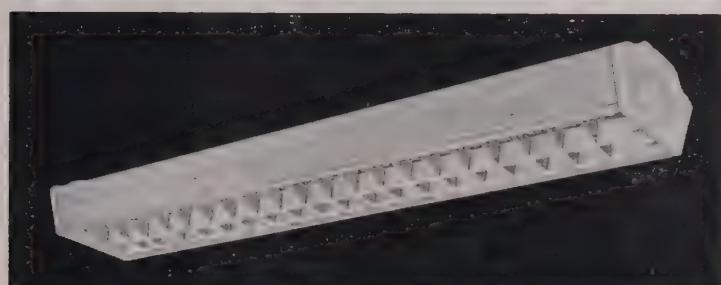
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## 'ETERNA' BP SERIES PERSPEX FITTINGS

Of very pleasing design the BP Fitting incorporates a one piece opal perspex reeded diffuser and is very popular in locations where shielded tubes are desirable, i.e. shops, offices, showrooms, etc.

Cat. No.	Tubes	Length ins.	Width ins.	Depth ins.	Weight lbs.	Fixing Centres ins.
BP 001	1-80 watt	64½	4½	5	15	24
BP 401	1-40 watt	49½	4½	5	9	24
BPT 802	2-80 watt	64½	6½	5	21	24
BPT 402	2-40 watt	49½	6½	5	12½	24



## 'ETERNA' LF SERIES STORE FITTINGS

Housing twin 4 ft. or 5 ft. tubes the LF fitting is recommended for use in show-rooms and departmental stores. A high level of downward light is obtained through the white metal louvre. Glass diffuser panels are fitted at the sides. Provision is made for conduit or chain suspension.

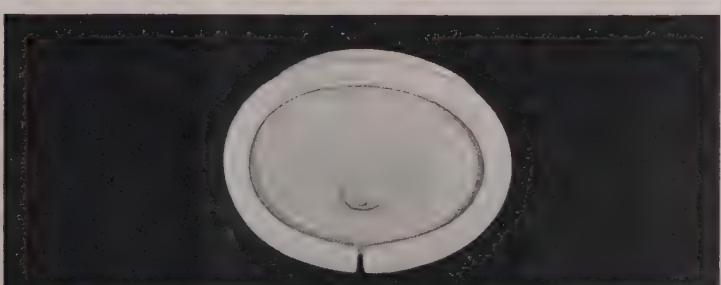
Cat. No.	Tubes	Length ins.	Width ins.	Depth ins.	Weight lbs.	Fixing Centres ins.
LF 802	2-80 watt	64½	14	7	37	36
LF 402	2-40 watt	63½	14	7	28	36



## 'ETERNA' TH SERIES INDUSTRIAL TROUGH FITTINGS

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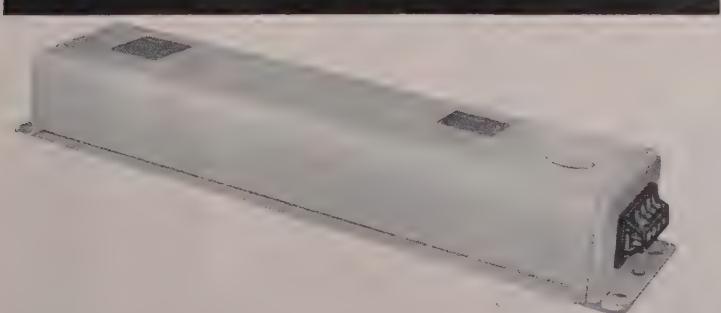
Cat. No.	Tubes	Length ins.	Width ins.	Depth ins.	Weight lbs.	Fixing Centres ins.
TH 801	1-80 watt	64	10½	6½	24½	30
TH 802	2-80 watt	64	10½	5½	28	30
TH 401	1-40 watt	51½	6	6	15	34



## THE 'ROUNDLITE'

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Cat. No.	Tubes	Diameter ins.	Depth ins.	Weight lbs.
RL 801	1-80 watt	17	3	8



## H.P.F. BALLAST UNITS SWITCH START

Cat. No.	Tubes	Voltage	Dimensions ins.	Fixing Centres ins.	Weight lbs.
B 108	1-80 w.	T or F	11 × 2 × 3½	10½	6½
B 104	1-40 w.	T or F	11 × 1½ × 2½	10½	3½
B 103	1-30 w.	T	11 × 1½ × 2½	10½	3½
B 102	1-20 w.	T	11 × 1½ × 2½	10½	3½

## INSTANT START

Cat. No.	Tubes	Voltage	Dimensions ins.	Fixing Centres ins.	Weight lbs.
IS 108	1-80 w.	T	14 × 2 × 3½	13½	8½
ISS 108	1-80 w.	F	16½ × 1½ × 2½	15½	8
IS 104	1-40 w.	T	14 × 1½ × 2½	13½	5½

T denotes TAPPED 200/250 v. F denotes FIXED 230/240 v.

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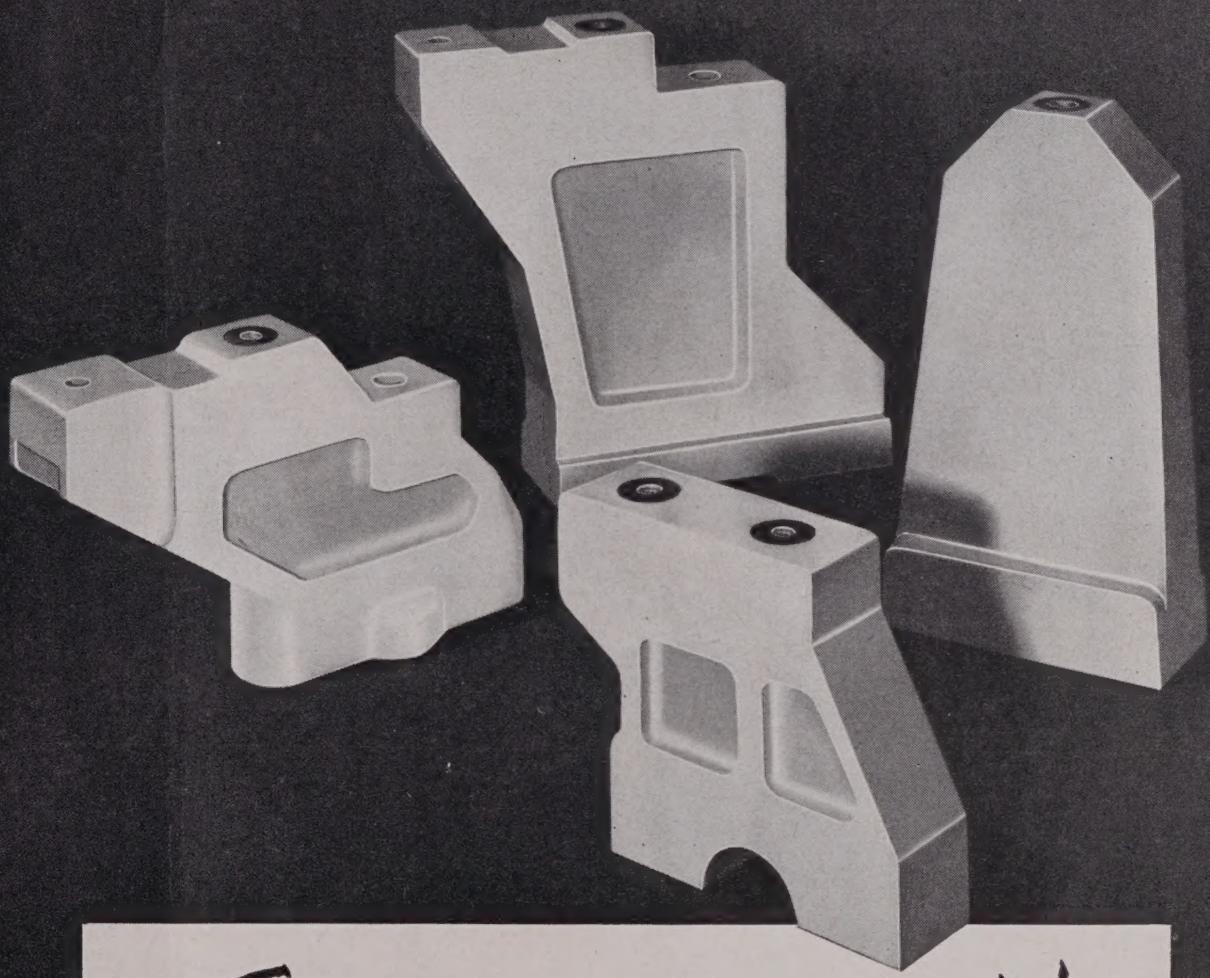
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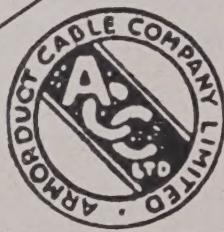
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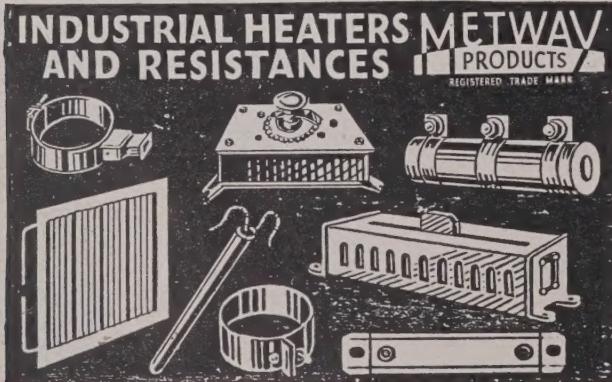
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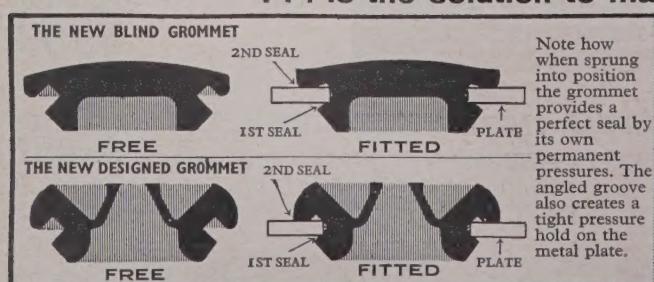


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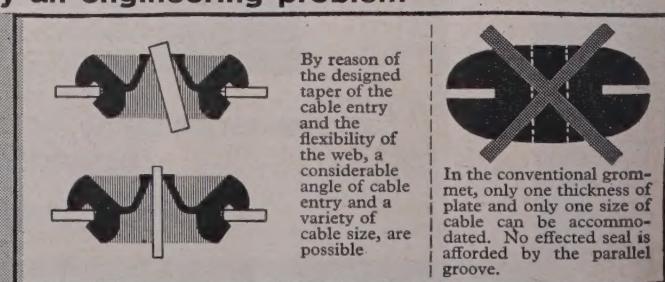
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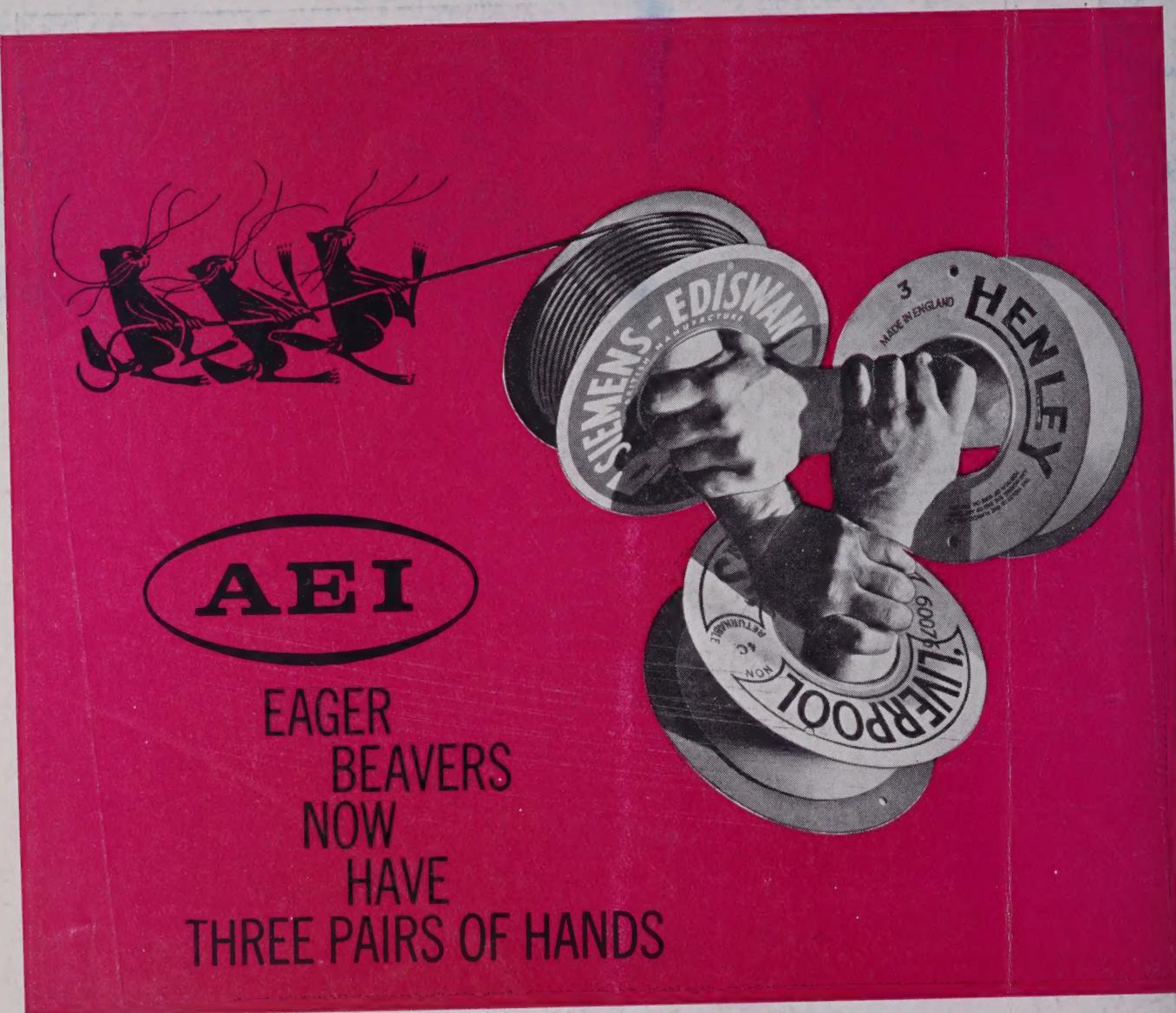
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